TECHNOLOGY DEPT.

Gas Journal

Vol. 272. 104th Year. LONDON, DECEMBER 24, 1952. No. 4673. Price 1/3
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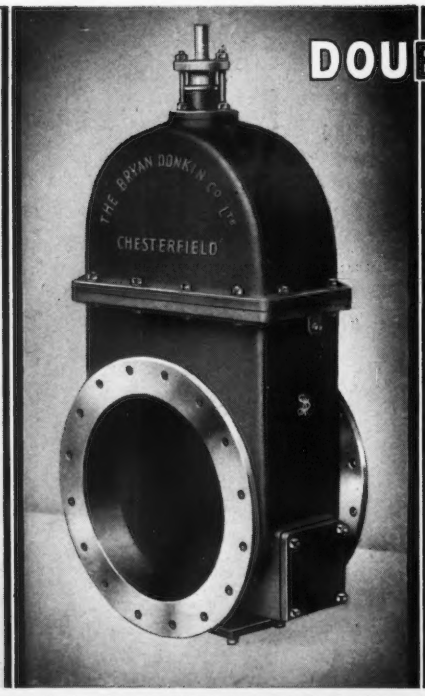

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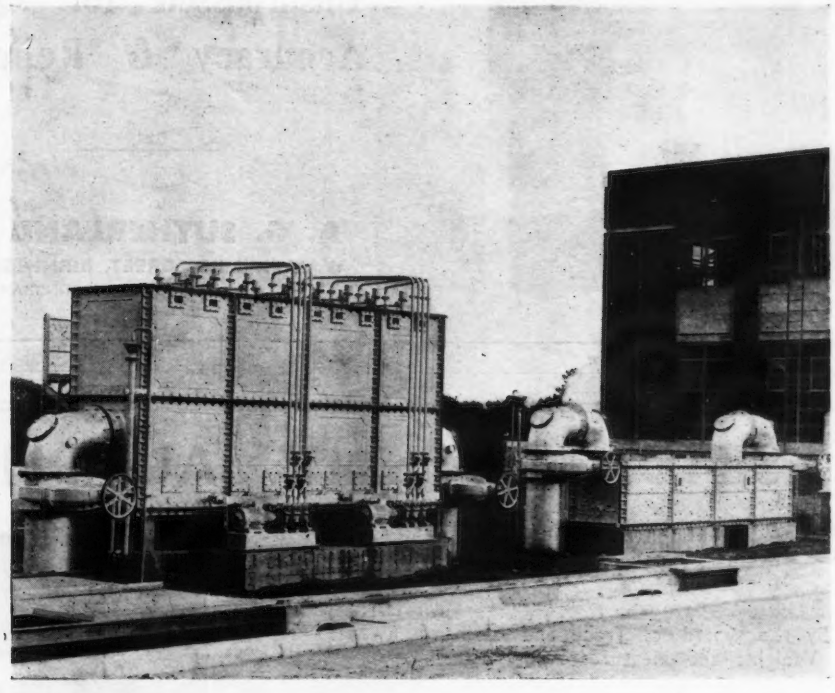

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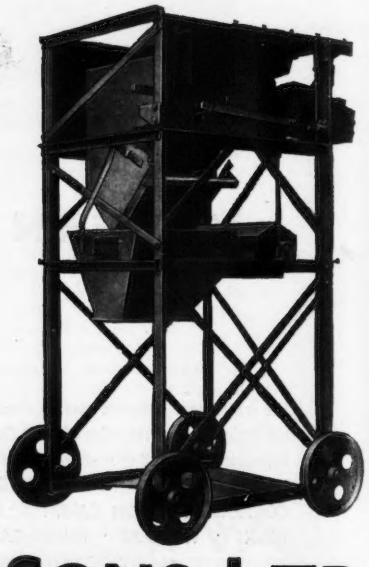

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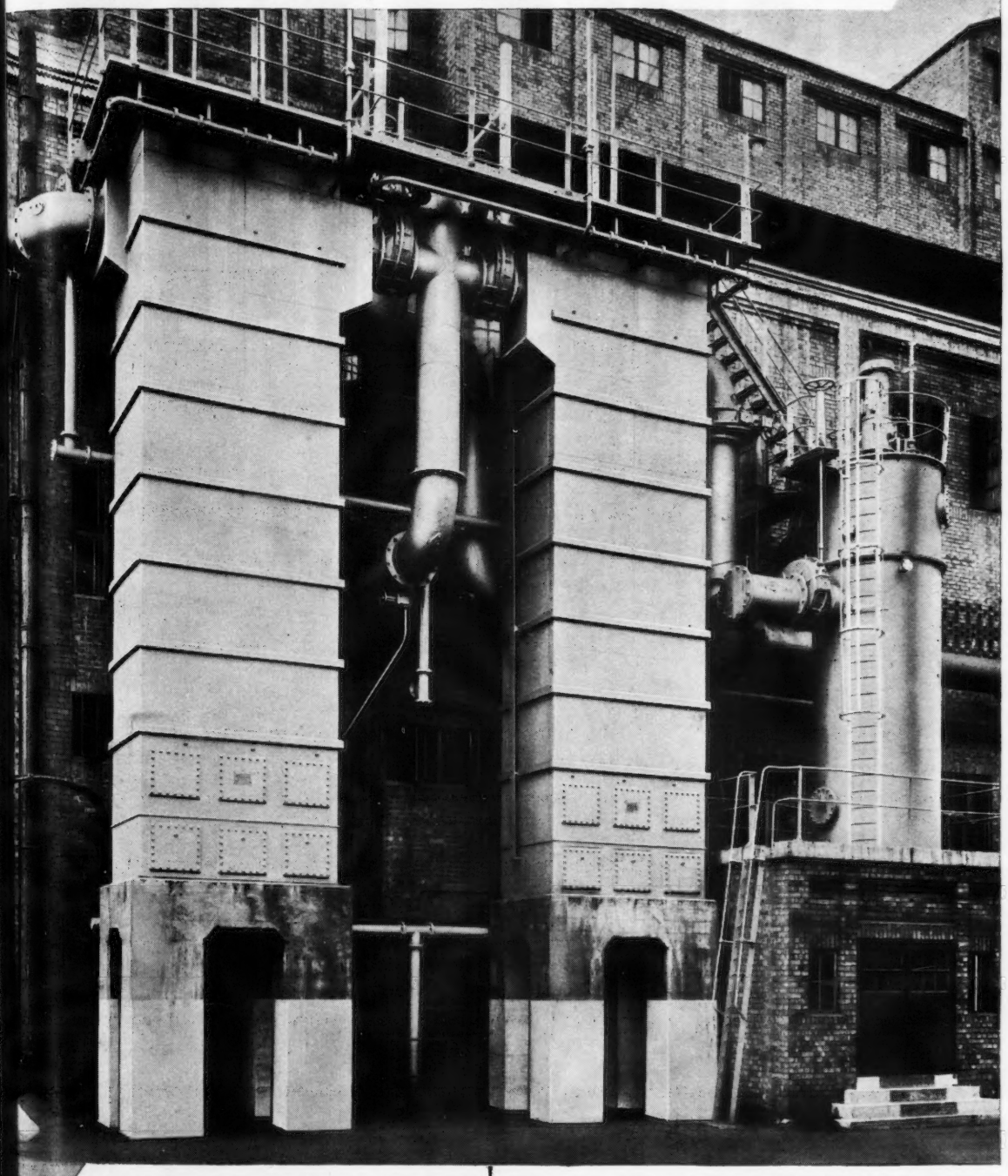

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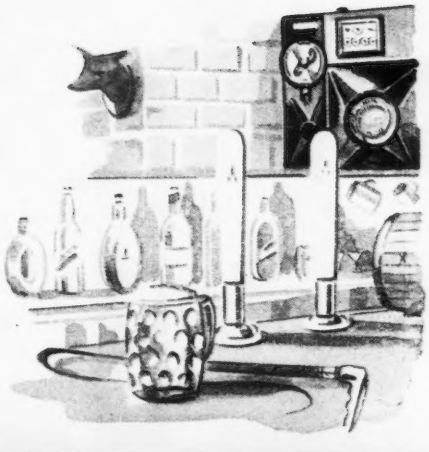

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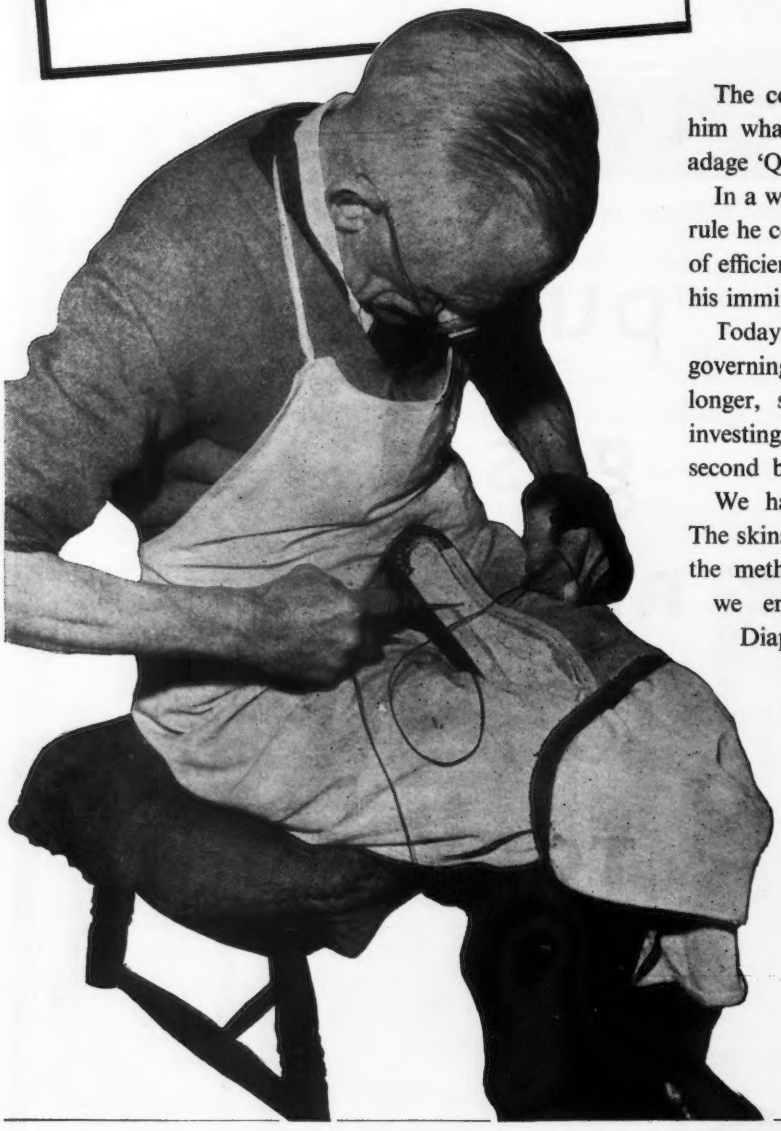

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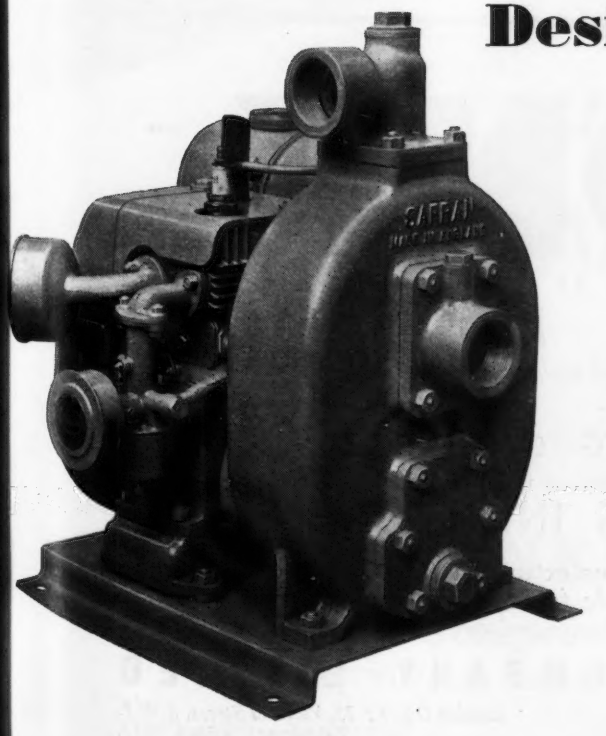

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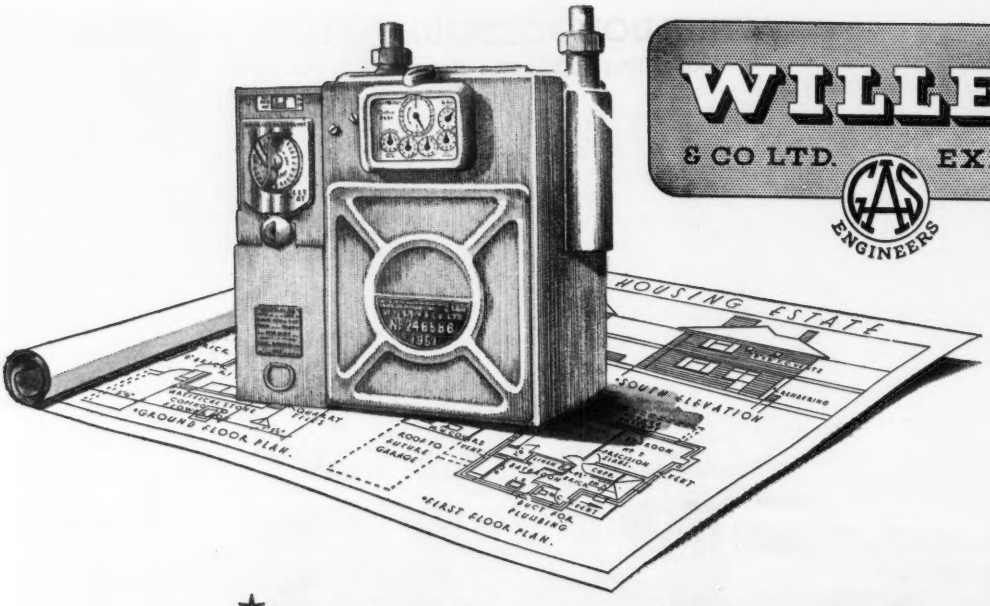

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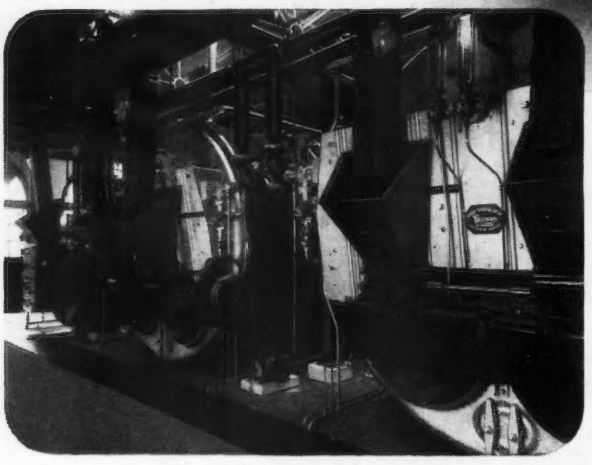
Illustrated is an installation of Paxman Economic Boilers



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remains permanently leak-tight. The gland, screwed into the socket, compresses a tipped rubber gasket which seals the joint. The Stanton Screwed-Gland Flexible Joint can be made in a waterlogged trench, or under similar difficult conditions. The only tools needed are those shown in our illustration: a 'C' spanner and a hammer.

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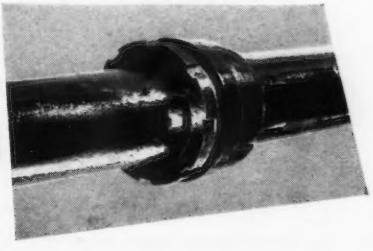

ONE MAN AND HIS STACKER . . .

he loads with it

1

Tows it

2

Unloads with it

3

It is amazing what one man can do when he has a C. & T. Light Mobile Stacker to help him. The photographs show one of these versatile, roadworthy machines loading waste firebricks into a lorry (photo 1), then being towed to a railway siding (photo 2) to discharge the bricks into a railway wagon (photo 3). The entire job is carried out quickly and simply—a much more efficient method than laboriously throwing the bricks into the vehicles. (Photographs by courtesy of Thomas Mouget and Co. Ltd., Contractors, Middlesbrough.)

The C. & T. Light Mobile Stacker is available in four sizes with maximum delivery heights between 10 ft. 8 in. and 18 ft. At minimum elevation the exceptionally low overall height allows easy access to all parts for maintenance. Drive is electric, diesel or petrol.

Stacking coal in a cellar within 2 ft. of the ceiling . . . a faster, less costly method than barrowing and shovelling as done previously. (Photograph by courtesy of Jowett Cars Ltd., Bradford)

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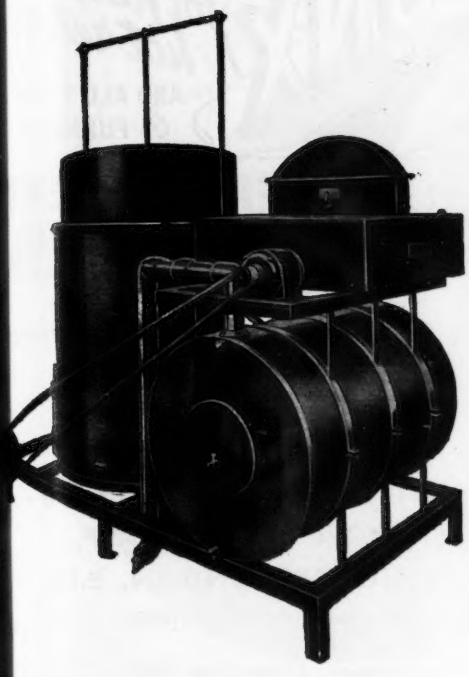

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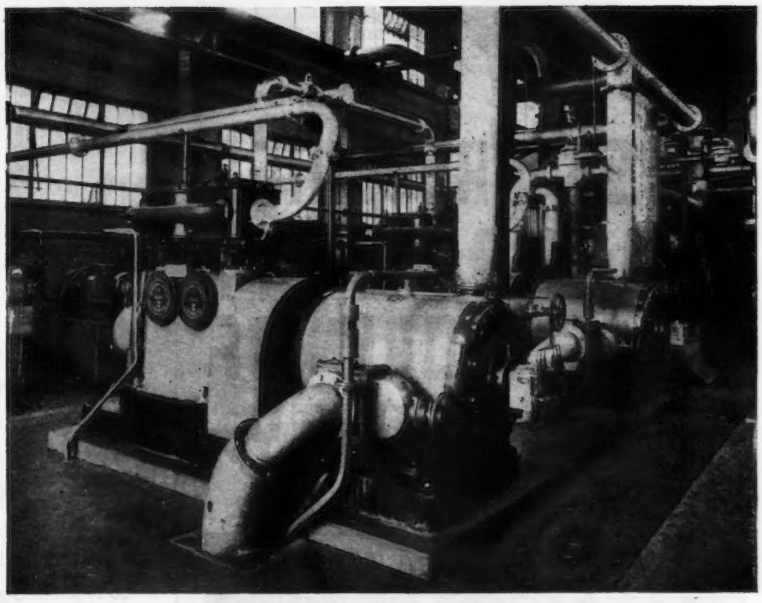

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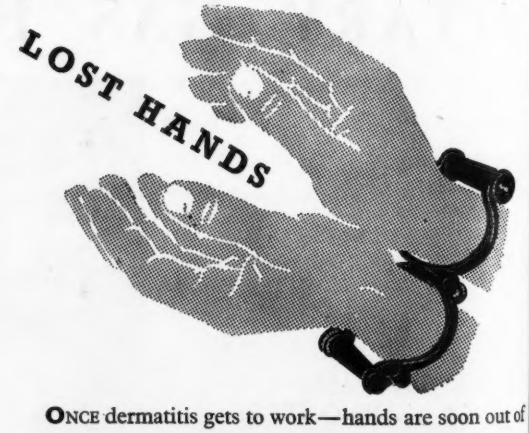

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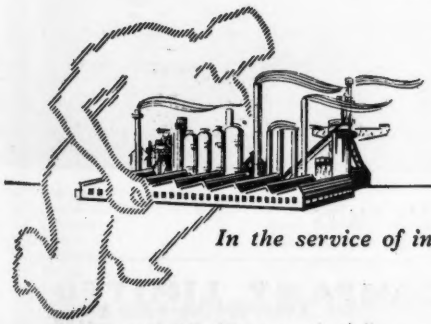

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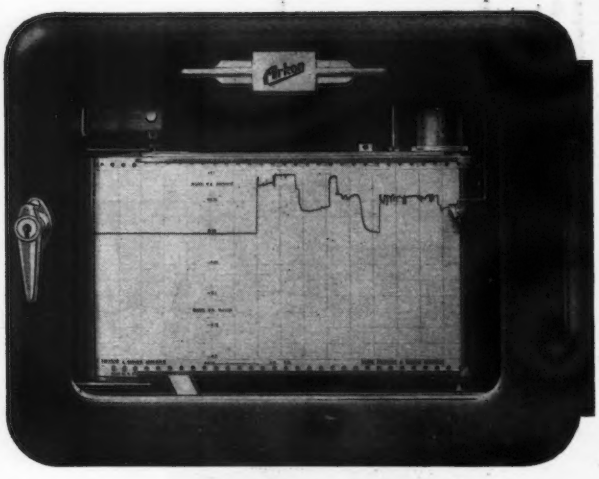

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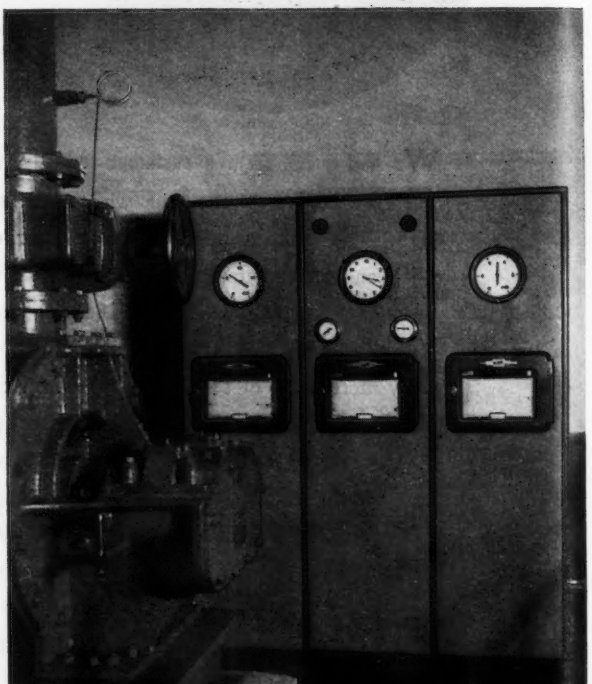

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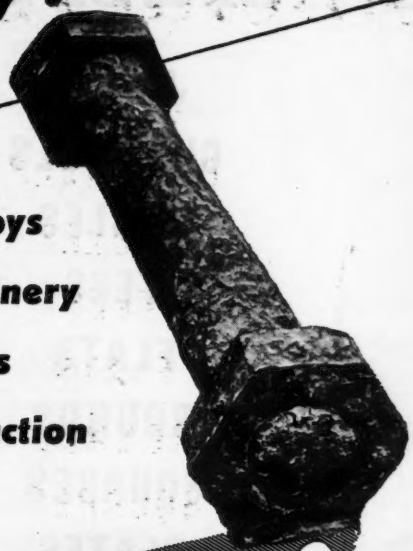

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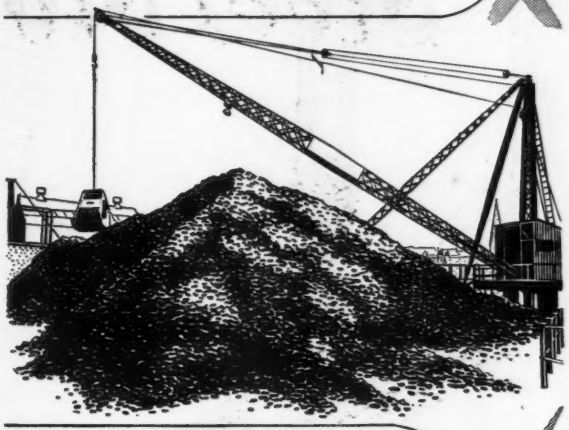
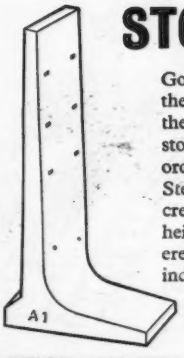


or Shipshape

—thanks to Stelcon STORAGE WALLS



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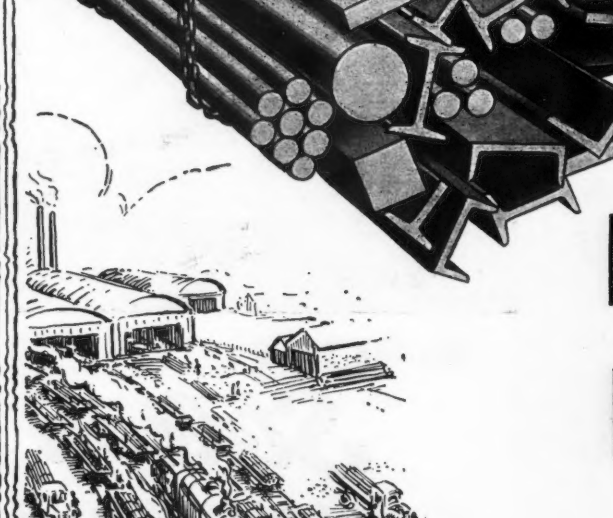

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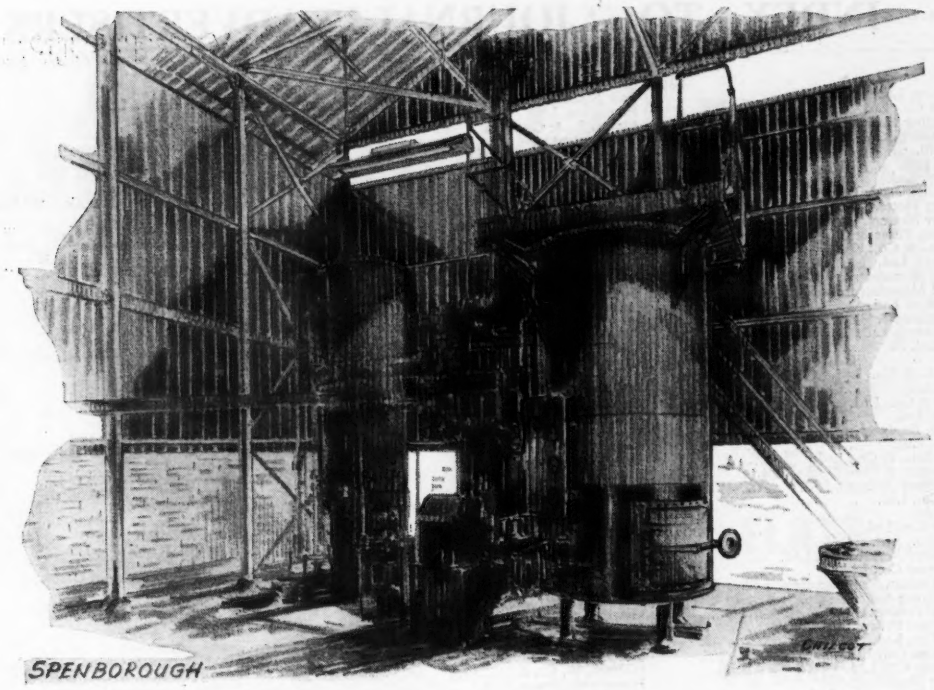

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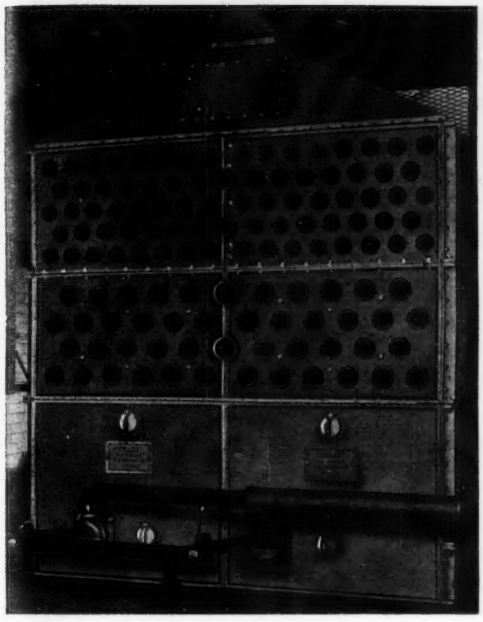

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104th YEAR OF PUBLICATION

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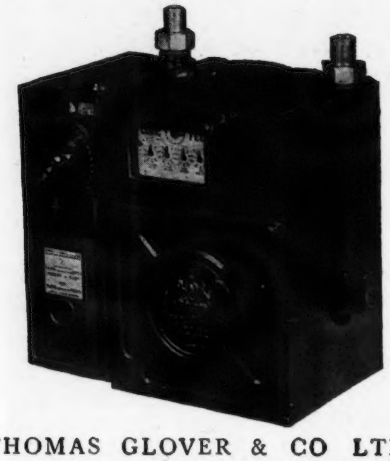

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GAS JOURNAL

VOL. 272. NO. 4673 104TH YEAR DECEMBER 24, 1952

AN ALL-GAS INDUSTRY

WITH the known combinations of carbonisation with producer gas or water gas it is not possible to produce more than some 150 or 160 therms in the form of gas per ton of coal treated, and then at a calorific value of not more than 350 to 400 B.Th.U. per cu.ft. without the addition of oil gas. In his presentation of the programme of full scale investigation, which is to be undertaken by the Birmingham Research Station under his direction, Dr. F. J. Dent sets out the problems before the gas industry. He speaks of the limitations of existing methods, the high coal demand per therm of gas produced, their requirement of a specific type of coal with low ash content, and what he calls their inflexibility, requiring auxiliary processes using oil to cover peak loads. He is not unaware of, though he does not emphasise, their advantage in the production of a solid fuel in the form of coke which in practice is a form of long-term heat storage which can go a long way to meeting the winter peak of space heating demand.

Dr. Dent, indeed, suggests that the modified Lurgi process in which 'plant dimensions are not related to gas rate' can be stepped up sharply to meet peak demands without the capital charges of standby plant. There is the further point that the plant may be so developed as to provide for the production of liquid hydrocarbons, such as methane, for storage against the winter load, thus simulating the rôle now played by coke.

It is very fitting that Dr. Dent, who has borne the burden and the heat of the preliminary work at the laboratory and pilot plant stages, should see this thing through the full scale trials. These are coming not before their time. Surely it is only the disturbances of the last decade which have to some extent robbed Britain of her lead in gas-making technique. Perhaps we have also been delayed by the persisting though dying mentality induced by an apparently limitless supply of high quality coal at prices which have long been below the real cost of production, real, that is, in relation to its full cost in man-hours. The effect of the rapid expansion of the gas industry in enforcing serious attention to the impending shortage of coal in general, and gas-making coals in particular, is only beginning to be recognised even in the industry itself.

Dr. Dent has set out the reasoning which has led to the selection of the plant which it is proposed to erect for full scale trial, backed by the powerful and well-informed support of Mr. G. le B. Diamond in whose judgment everyone will have confidence. The bed-rock of the reasoning seems to be that this process leads to the formation of synthesised hydrocarbons (mostly methane) from the coal substance itself in combination with steam under pressure, taking the place of those hitherto obtained from petroleum oils. These oils appear to be always likely to be high-priced, in spite of the expansion of oil refinery in this country—and, what some of us will realise for the first time, 'the proportion of hydrogen in oil is only about half that in a saturated hydrocarbon such as methane, the most desirable hydrocarbon for enrichment purposes.'

We take it then that we are to have an installation of considerable capacity on the lines of the Lurgi process using oxygen and a catalyst and operating under pressure. Weakly coking coals will be used. The gas produced will be of calorific value and combustion characteristics comparable with that now distributed in the Birmingham district, enrichment being effected by methane synthesis within the system. The gas will be readily freed from sulphur compounds and will be available at pressures which will greatly ease distribution over long distances. A truly desirable prospect and one which appears capable of realisation at not uneconomic prices.

We are grateful to Dr. Dent for summarising so lucidly the present position not only of the Lurgi process but of other possible methods of solving the problem of complete gasification. Our appetite for further work along some of these lines is whetted by

the possibility of an overall thermal efficiency of 80%, as, for instance, in powdered fuel gasification. With some such result as this the industry could face up to the loss of its coke market, could become an all-gas industry, providing a fuel supply in its most convenient and effective form with an economy of raw coal at present quite outside our reach. Freed from the necessity of working with gas-making coals we may be able to drop the limitation implicit in our claim that all 'suitable' coals should be processed before use as fuel.

The 'broad outline' of the research programme to which the Birmingham Station has set its hand will be filed as something of an historic document—a charter for the all-gas industry.

EFFICIENCY

IN engineering parlance the efficiency of a machine is the ratio between the work done by the machine and the work put into it. It would seem, therefore, that the only definition of the efficiency of a thermal transformation process with any physical meaning is the ratio between the heat content of the products and that of the raw material. There is nothing 'conventional' about that. It particularly applies to carbonisation which is essentially a process of up-grading. The raw coal is transformed into gaseous and solid fuels which can be utilised with more effectiveness—higher efficiency, in the sense that more heat is directly utilised in space heating, water heating, and cooking for a given supply of fuel—and in both cases without the emission of smoke.

The discussion of the short and impartial statement by Mr. J. E. Davis on the efficiency of coal carbonisation was one of the liveliest and most entertaining that we have heard at a research, or, indeed, any other, meeting of the Institution of Gas Engineers. The figures taken as the basis of his statement represent a fair average of good working with a rather poor Durham coal when making gas for distribution at 500 B.Th.U. per cu.ft.—75 therms in gas and 10 cwt. of coke per ton of coal treated. The total thermal content of the products, including breeze and tar, is 81% of the heat content of a coal at 300 therms per ton, 13,400 B.Th.U. per lb. Rejecting the tar, as seldom used for fuel purposes, the useful potential output drops to 75%. There is a good case for the retention of the breeze. It is perfectly good fuel. On a suitable mechanical stoker it will raise as much steam as any other fuel in proportion to its carbon content.

In Church House the battle swayed this way and that. The weight of academic authority was in favour of the view that neither of the two methods of expressing efficiency had an exclusive claim to be called 'scientific.' But if one doubted that common-sense dictated the rejection of Method B if not the indiscriminate use of Method A, those doubts should be resolved on noting the unquestioning way in which the lower figure was adopted by the Ridley Committee. Absurdity reaches its nadir in the application of Method B to gas made in and purchased from coke ovens, where it would take the form of 'efficiency of coke production,' gas being then produced with 100% efficiency. As Dr. A. Parker put it, the gas industry would be much more efficient if it bought the whole of its gas from the coke industry. The invention of the idea underlying this so-called 'efficiency of gas production' was, according to Dr. G. E. Foxwell, one of the greatest disservices ever done to the gas industry.

Major consideration is to hold to the case for the methods of the gas industry as the cheapest means in terms of coal, if not always of money, of supplying heat in a convenient and effective form to the industry's best customer—the domestic consumer. The experiments at Abbots Langley, set out in the paper by Dr. Davis, have shown that a judicious combination of gas and coke gives the required service of space heating, cooking, and hot water supply with a lower expenditure of raw coal than any other fuel or combination of fuels. Gas alone would be even more economical in coal consumption. This will still be true when complete gasification takes the place of carbonisation even at considerably lower 'efficiency.' The case against all gas with present practice is the high monetary cost of the winter peak supply.

The fact which we must make clear is that the results at Abbots Langley confirm our claim to do the job with gas and coke at four tons of coal per house per annum.

NATIONALISATION UNDER REVIEW

THE Chairmen of the National Coal Board, London Transport Executive, and British Electricity Authority, and the Deputy Chairman of the Gas Council have been taking stock, and the outcome is the publication by the Institute of Public Administration of *Efficiency in the Nationalised Industries* (George Allen and Unwin, 7s. 6d.), a series of papers by the four authoritative men engaged in the management of the publicly owned industries, with a foreword by Mr. Herbert Morrison, who shared with the late Lord Ashfield the task of creating London Transport, probably the first large experiment in the conversion of private and municipal trading into a public enterprise. The authors address themselves mainly to efficiency in their respective spheres, and Mr. Morrison admits that many changes in the organisation of the industries may have to be effected. As a whole he thinks they are serving the country well. Improvements have been effected but the process of adaptation and development will last for many years—indeed they may never finish, for lively management cannot stand still. Among problems that still remain, Mr. Morrison mentions public accountability, the proper field of Parliamentary questioning and discussion, and means whereby Members of Parliament and the public can be satisfied as to the efficiency of the undertakings and that instruments are available for investigating particular difficult problems as they arise.

In his chapter on the gas industry, Mr. Henry H. F. Jones shows how the area boards have striven to raise the efficiency of the weaker undertakings and at the same time to maintain the standard of those already efficient. Having given a broad picture of the industry

in general, he describes the work of the East Midlands Board in greater detail and applies it to the main theme of the book—the maintenance and improvement of efficiency—to which end he emphasises the importance of standardisation, employee relations, joint consultation, research, and planning for the future. He believes that in the future even more attention than hitherto will have to be paid to the selection and training of staff and to joint consultation with employees. Further benefits can accrue from examination of operations by statistical methods, but in the longer run statistics, although useful and indeed essential, are no substitute for an efficient costing system, and he believes that the normal commercial procedure of forecasting expenditure and revenue must be strictly applied, leading when possible to budgetary control. 'Planning for the future,' he writes, 'is on sound technical and economic lines, and because our knowledge of the processes involved in the manufacture and utilisation of gas is constantly expanding, I believe that the gas industry will continue to take an increasingly important place in the provision of vital fuel services to the nation.'

Mr. Morrison favours an efficiency unit in which would be employed first-class industrial consultants with the capacity to work in a co-operative way with management and with labour in the investigation of snags of a serious character which arise and for which the members of the board need skilled and responsible advice. There is a question as to whether this common efficiency unit should be the instrument of the boards collectively or of the Ministers concerned, or both. The fact has to be faced that the publicly owned industries are vast undertakings and Parliament and the public have a right to be satisfied that all the services are available to ensure efficiency and good and economical public services.

Personal

Mr. Brian Hill, Publications Officer of the Gas Council, has had published by Rupert Hart-Davis, Ltd., his translation into English verse of 'The Drunken Boat,' 36 poems of the French poet Arthur Rimbaud.

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Mr. B. R. Fraser, B.SC., has been appointed Assistant Refinery Manager of the Vacuum Oil Co. refinery, now nearing completion at Coryton, Essex. Mr. Fraser, who is an honours graduate of St. Andrews University, joined the Burmah Oil Co. in 1927 as a plant chemist at the Digboi refinery in Upper Assam, India. At various times he was in charge of each of the refinery departments, and in 1945 was appointed Assistant Refinery Manager, and later occupied the position of Refinery Manager.

◇ ◇ ◇

Dr. Harold Hartley, C.B.E., has been awarded the Melchett Medal of the Institute of Fuel for 1953 in recognition of his high scientific attainments in the development of domestic heating appliances coupled with the administrative skill with which he has guided a great industrial organisation devoted to the practical efficient use of fuel. Dr. Hartley is Chairman of Radiation Ltd., past President of the Institution of Gas Engineers, and past President of the British Cast Iron Research Association. He is President of the Institute of Vitreous Enamellers, and is also one of the D.S.I.R. Visitors to the British Coal Utilisation Research Association.

Mr. W. H. Gillcox will retire at the end of the year from active service with Falk, Stadelmann & Co., Ltd. Mr. Gillcox joined the company in 1902, and has represented it in all the various sections of its business for over 50 years with the exception of service with the Royal Flying Corps from 1916 to 1919, in which he served overseas. Since 1919 he has operated exclusively with gas undertakings, and he will continue to keep in touch with his old friends at divisional headquarters.

Obituary

ALEC E. R. LOGAN

It is with very great regret that we announce that **Mr. Alec Logan** died last Wednesday night at his home No. 50 Audley Road, Ealing. For nearly six years he had been London Advertising Representative of the *Gas Journal*, *Gas Service*, and other Walter King publications. He was 61 years old.

Alec Logan will be sadly missed not only by all of us of Walter King, Ltd., but by a great circle of friends gathered round him by his own personality and industry.

Educated at The Perse, Cambridge, he made his way direct from school to Fleet Street in 1907, and until the first war worked with S. H. Benson, Ltd., and with Willing and Co., Ltd. In October, 1914, he was appointed Temporary Captain and Paymaster and served in that capacity until 1923. He then returned to his old work—and hobby—of space selling, now for Illustrated Newspapers, Ltd., remaining with them until the second war forced a change. From February, 1941, to the end of 1945 he represented *The Times* and its Supplements, while many of that great newspaper's men were absent on other duties.

On an introduction from Mr. John Mitchell, of Whitefriars Street, the writer of this memoir interviewed Alec Logan in February, 1946; and within three days he joined us. Two passages in that interview remain fresh in mind. To the suggestion that a small private firm could not make much of an offer to a man of his age and experience, he replied: 'I think yours is the sort of firm I would like to work for.' Confronted with the comment that he knew little of the gas industry and its apparatus, he rejoined: 'But I shan't be selling gas or gas cookers; I sell space.' He was most certainly right. He walked straight into the pattern and the affections of us all; and his work has been amazingly successful. Many may not know that he was blind in one eye and could not use a car; but nothing daunted his tenacity until the onset of his last illness at the end of October. He had been a keen rowing man and rugby footballer, and on the bigger occasions never failed to find a new prospective client in the Henley or Twickenham neighbourhoods.

To his widow and young son and to his daughter by a former marriage we extend our deepest sympathy.

CLIFFORD A. KING.

Diary

Jan. 2.—London Juniors: Paper by W. G. Phillips, M.A., 178, Edgware Road, W.2, 6.30 p.m.

Jan. 6.—Midland Juniors: 'Recent Developments in Domestic Heating Research,' Dr. J. Shack, Birmingham.

Jan. 6.—South Eastern G.C.C.: Caxton Hall, Westminster, S.W.1, 2.15 p.m.

Jan. 6.—East Midlands G.C.C.: Victoria Station Hotel, Nottingham, 11.30 a.m.

Jan. 6.—Institute of Fuel (Scottish Section): 'The Ridley Report and After,' Gerald Nabarro, M.P. (Kidderminster); Royal Technical College, Glasgow, 7 p.m.

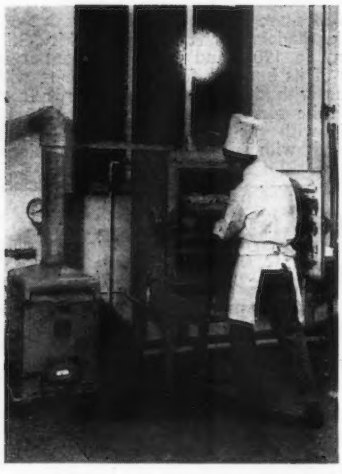
Jan. 7.—Manchester Juniors: Evening Meeting at Manchester Showrooms; Short Papers for the F. Johnston Prize.

Jan. 7.—Institution of Heating and Ventilating Engineers: 'The Design of Coke Burning Appliances,' Dr. F. J. Eaton (North Thames Gas Board); at the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m.

Jan. 10.—Scottish (Western) Juniors: Meeting at Heriot-Watt College, Edinburgh. Address by Dr. E. A. C. Chamberlain, Chief Scientific Officer, National Coal Board.

Jan. 12-13.—Women's Gas Federation: Eighth Branch Conference, Caxton Hall, Westminster, S.W.1.

Southend Students Learn to COOK by GAS



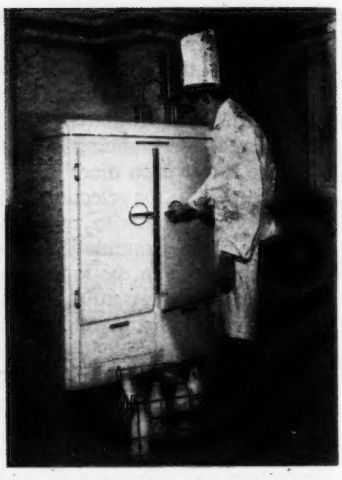
A student at the gas heated steaming oven. Alongside is the 'Rex' gas boiler that provides hot water to the kitchen.

OF all types of gas catering equipment installed throughout the length and breadth of the country at the present time we suggest that none surpasses in value to the industry that which is used to train student cooks and caterers. For it is the impressions given to them in their early formative days of training which may well influence their preference for and choice of appliance throughout the whole of their future careers.

For this reason it is not surprising that we welcome, and give special prominence in these pages to, examples of gas equipment in training colleges and schools and wherever the art of cooking is taught. Gas boards which give special attention to this kind of installation are sowing seeds which will be harvested far beyond the confines of the town in which the particular equipment is being used to train the caterers of tomorrow. It is consequently of paramount importance to ensure that none but the best and most up-to-date appliances are fitted in such training centres.

We illustrate on this page one of the latest installations of this kind—to be found in the self-contained hotel and catering unit recently opened at the Southend-on-Sea Municipal College. Designed to accommodate 45 full time, 75 part-time, and 100 evening students, the unit already had 69 students enrolled for training within a few weeks of its opening. The Principal of the college is Mr. T. L. Morgan, and Mr. J. Vincent, who was previously at Blackpool, is in charge of the hotel and catering unit.

This student is using the gas heated salamander at the Southend-on-Sea Municipal College.



No modern kitchen is complete without its refrigerator. Here is an Electrolux gas operated model in the store room.

Facilities have been provided for special and seasonal courses on managerial problems, waiting, and for proprietors of small hotels, in addition to the usual hotel and catering training. There is a 'training' restaurant or dining room with seating for 32 persons, in addition to a fully equipped kitchen and stores.

Extensive gas equipment for the kitchen has been installed by the North Thames Gas Board, including Benham 8-oven 'solid-top' range, hot closet and open bain marie, steaming oven, boiling pan, salamander, stockpot stove, and boiling table, all in vitreous enamel finish; Stills café set; Electrolux 10 cu.ft. refrigerator, and De La Rue 'Rex' boiler.

Mr. J. Vincent explains 'Kitchen organisation' to first year students.

General view of the kitchen showing the central 8-oven restaurant range.

GAS CATERING IN NEW CITY OFFICES

ON the site of Salters' Hall, St. Swithin's Lane, which was destroyed by enemy action in 1941, has sprung up one of the biggest post-war blocks of offices in the City of London. A substantial portion of this huge building, which overshadows the Mansion House, is occupied by the Shell Oil Company, which has provided for its staff a restaurant embodying the most up-to-date catering facilities and including a considerable amount of gas apparatus.

Mr. Daniels, Catering Manager, together with Mr. Wynd and Mr. Jones, of the Shell Company's Engineering Department, working in co-operation with Benham & Sons, Ltd. (who supplied all the kitchen equipment and carried out its installation as well as the kitchen ventilation) were responsible for the kitchen planning.

The Staff restaurant seats at least 360 persons, and caters for 1,400 at four sittings. Seating is provided at round tables, which are topped with heat resisting materials, by comfortable semi-arm beechwood chairs, with red upholstery. Acoustic tiles cover the ceiling and do much to lessen the clatter of crockery and cutlery that is often associated with restaurants. A feature of the restaurant is the coffee room—a pleasing place indeed, where the staff can take coffee after lunch in different surroundings to that of the restaurant. The main purpose of the coffee room is that as soon as the staff have finished eating, they vacate their tables—thus providing for a faster flow throughout the restaurant.

General view of the kitchen at St. Swithin's House.

The kitchen is designed both for working and service efficiency. All departments are planned in sequence from goods-in right through to their appropriate stores and preparation sections. Special attention was also given to quick passage of foods from the cooking apparatus in the hotclosets which have sliding doors on both sides; this allows direct access from the kitchen through to the service counter.

Ventilation in the kitchen gives 50 complete changes of air per hour, hoods over the cooking equipment are of anodised aluminium and have concealed lighting on the insides, and carry away cooking smells, excess heat and steam through duct work and trunking to the outside of the building. The ventilation also carries stale air from the restaurant; this air is assisted through the service bays by pressure of the incoming fresh air on the opposite side of the restaurant.

Among the large amount of gas apparatus manufactured and installed by Benhams are an 8-unit Mark III central pattern 'Solid-top' range, two units having open flame boiling tops, and each oven being fitted with thermostatic control; single compartment roasting oven; two-unit deep fat fryer, thermostatically controlled; double-compartment griller and toaster; and wall pattern boiling table top.

Juniors at Caernarvon

ON NOVEMBER 29, some 30 members of the North Wales Section of the Wales and Monmouthshire Junior Gas Association, in company with their Chairman, Mr. J. Woodcock, examined the Tully plant recently erected at the Caernarvon works. The plant is automatically operated, and is capable of producing 300,000 cu.ft. of 500 B.Th.U. gas per day.

Following the visit a meeting was held at the Royal Hotel, at which Mr. W. E. Whitney, of Bridgend, read a paper entitled the 'Administration and Development of a Small Undertaking.'

A vote of thanks to Mr. Whitney was proposed by Mr. R. H. R. Tomkins (Bangor), seconded by Mr. R. Cleaver (Connah's Quay).

After the meeting the members were entertained at tea by the Caernarvon undertaking of the Wales Gas Board. On the proposition of Mr. H. J. Stanley (Penmaenmawr), seconded by Mr. H. Parry (Holyhead). A vote of thanks was accorded to the undertaking coupled with the name of Mr. A. Mawson, the local Manager, who briefly responded.

EASTERN JUNIORS AT LANCELOT WORKS

MEMBERS of the Eastern Junior Gas Association spent an exceptionally interesting day at the works of Bratt Colbran, Ltd., at Lancelot Road, Wembley, on December 10. The President, Mr. J. Anderton (Great Yarmouth) and members of the Council met at the works during the morning and were entertained at luncheon under the chairmanship of Mr. Eric C. Bratt, Mr. Anderton voicing the thanks of the guests. Some 50 members joined the party in the afternoon.

Special interest was taken in the laboratory, which is concerned with gas appliance design and development, the control of quality of materials, and the finished product. Stages in the design and development of a new space heating appliance were illustrated, and methods of test were demonstrated, including the test bench for the determination of a complete heat balance.

Routine inspection, checking of components and of the finished product, are under laboratory control and examples were seen during the tour. All incoming goods are inspected before acceptance, gas cocks, etc., being tested to Institution specifications and threads, etc., to British standards.

On the production side the visitors saw the tool shop, press shop, finishing, and assembly departments. In the woodmill and joiners shop were seen the manufacture and finishing of wood mantels and instrument panels. Gas and solid fuel fired wholehouse warming plants were inspected in production, incorporating results of tests in the Stanmore houses of Radiation Ltd.

The industrial department working in conjunction with the drawing office provides technical assistance in the planning of heating installations and radiant heat processing plant and in an adjoining room are facilities for the display of live industrial appliances and for pilot heat treatment tests.

At the close of the tour, the visitors were entertained at tea. Mr. E. H. Winch (Cambridge), past President, voiced the thanks of the visitors for an enjoyable visit, and Mr. R. H. Lewis, General Sales Manager, assured them of a warm welcome. After tea a selection of coloured slides were shown of overhead radiant heating installations.

IN PARLIAMENT

THERE are two subjects (at least) on which hon. Members are determined to allow the Minister of Fuel and Power no respite judging from the regularity with which they crop up at Question Time in the House. One is pipes and the other is pensions; and if our readers find a certain repetitive monotony in our frequent references to them in this column we offer by way of excuse our desire to keep our Parliamentary record as complete as possible. More important, perhaps, is the indication that a considerable number of Members have the welfare and progress of the gas industry very much in mind.

Pipes and Pensions

The emphasis on pipe shortage in the industry shifted on December 15 from the West Midlands to the East Midlands when Mr. G. H. OLIVER (Ilkeston) asked the Minister whether he was aware of the shortage of steel and cast-iron pipes which is retarding major projects of development in the area of the latter Board; and whether he would make a statement on the position.

Mr. GEOFFREY LLOYD'S reply followed the usual lines—that the difficulty is a general one, but he hoped the position would shortly improve.

On the same day two further questions on ex-municipal pensioners also took the now familiar form of enquiry with regard to the pension position of superannuated members of corporation gas departments transferred to the employment of Gas Boards. Was the Minister yet able to state whether they would receive benefits equivalent to those conferred on retired local government officers by the Pensions (Increase) Act, 1952? The Questions were put down by Mr. C. L. HALE (Oldham, West) and Lieut.-Commander G. I. C. HUTCHISON (Edinburgh, West).

Mr. LLOYD replied with a brief 'No, not yet.'

Prepayment Meters

Whatever may be the rights and wrongs of the matter, there has always been a widespread feeling of injustice in holding a consumer responsible when his prepayment meter is robbed. This question was raised by Mr. H. B. H. HYLTON-FOSTER, Q.C. (York), who asked the Minister of Fuel and Power if he would consult the Gas Council with a view to giving a general direction under Section 7 of the Gas Act, 1948, that whenever a domestic consumer is bound by the terms and conditions of supply to pay to a Board any deficiency of money in a prepayment meter arising from theft the Board shall not, without the consent of the consumer, install or maintain a prepayment meter outside the consumer's house.

Mr. LLOYD thought that this was a matter which was better left for settlement between Gas Boards and consumers, according to local circumstances.

Consultative Council Nominations

Mr. G. ROBERTS (Caernarvon) asked the Minister if he would include county associations of parish councils in the list of bodies invited to make nominations to consultative committees.

In making appointments to consultative councils, replied Mr. LLOYD, he already consulted the national bodies representing county and rural district councils. He did not feel that it would be practicable, having regard to the size of the consultative councils, to receive nominations also from the county associations of parish councils.

Timber Progress

EDITED BY MR. W. E. BRUCE, Secretary of the British Wood Preserving Association and formerly Chief Education Officer and Regional Manager of the Timber Development Association, *Timber Progress*, incorporating a desk book for 1953, contains a series of articles by recognised authorities on the main aspects of the timber trade, both technical and commercial, a comprehensive bibliography on timber literature, and other useful reference items.

Important among kindred organisations are the Association of British Chemical Manufacturers, the Association of Tar Distillers, and the British Tar Confederation, and from the point of view of the gas industry a particularly interesting chapter is that on the preservative treatment of timber, by Mr. H. A. Cox, Technical Director of the British Wood Preserving Association, covering as it does the important part played by creosote. The aim of *Timber Progress* is to record annually in authoritative, independent, and easy-to-read articles the new ideas, new movements, and latest achievements in the technology of the timber and allied industries.

The Cold Spell brought new records in the consumption of gas in Edinburgh. Production on December 1 by Edinburgh district of the Scottish Gas Board was exactly 27 mill. cu.ft.—the second highest figure ever recorded, and an increase of more than 5 mill. cu.ft. on the corresponding day last year. The total output of gas during the week was 171 mill. cu.ft., the highest week's production ever recorded in November.

G.C.D.S.

ON DECEMBER 9 AND 10, at the Rudolf Steiner Hall, N.W.1, the Gas Council Dramatic Society presented 'Candied Peel'—a comedy drama by Falkland L. Cary. The play was produced by W. G. du Bedat and the performance was polished. The entertainment was, in brief, of high standard—obviously the result of talent for acting coupled with hard and enthusiastic work in rehearsal. Indeed, the whole show brought a new light to bear on those taking part whom normally we meet in more mundane circumstances at Gas Industry House.

We do not intend—nor are we equipped—to pose as dramatic critic or to single-out individual performances. Enough to say that we came away from the Rudolf Steins Hall in happy mood after a thoroughly enjoyable evening. We hope we shall be invited to the next play put on by G.C.D.S.

Those taking part were: Leslie F. Stemp, Winifred Fraser, Helen Fox, Joan O'Callaghan, Mary Bishop, Marjory Philbrick, Ralph Beck, Joan Curry, Thomas B. Scott, Arthur Simmons, Marjorie Milne, and Leonard Williams. Stage Manager was Joan Plank, and effective back-stage work was put in by Beatrice A. Rowe, Lesley Griffiths, and Jill Bolton.

Hearty congratulations!

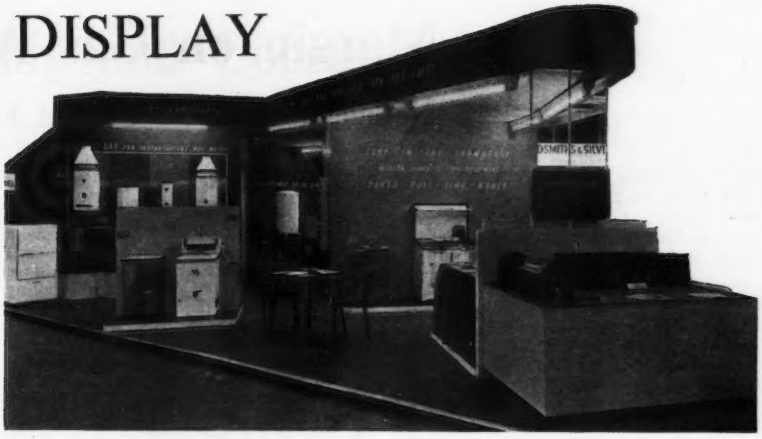
Mr. Gerald Nabarro, M.P. for Kidderminster, will address the Scottish Section of the Institute of Fuel on 'The Ridley Report and After' at a meeting at the Royal Technical College, Glasgow, on January 6. This will be the first occasion on which the report has been discussed publicly in Scotland.

The National Joint Standing Committee for Intermediate Grades in the gas industry has agreed that an increase of £15 per annum shall be applied to all scales as laid down in the national agreement for male intermediate grades employed in the industry. Female intermediate grade employees will receive an increase of £12. The increase takes effect as from November 30, 1952.

A Property Transaction, involving a site of five acres on the south bank of the Thames, has recently been completed. The site adjoins the mouth of the river Wandle and includes various factory and warehouse buildings; known as Allsop's Wharf, it has been in the ownership of the Allsop family for about a century. The purchasers are the South Eastern Gas Board, whose Wandsworth works are on the opposite side of the Wandle, and the price paid, although not disclosed, is believed to be in the region of £200,000. Harold Williams and Partners, Chartered Surveyors, negotiated the purchase on behalf of the Board.

Liverpool Safety Record.—During the four-week period from October 27 to November 23, not one of the 3,000 employees, including the drivers of motor transport, of the North Western Gas Board's Liverpool group had any 'lost time' accident at work. This record of freedom from accident was due, the Group General Manager states, largely to the safety measures in force throughout the group and to the co-operation of every employee. Safety committees at each works in the Liverpool area have been an essential part of the group's accident-prevention organisation for many years. They have produced now what is believed to be a record for an organisation of this large size.

USEFUL GAS DISPLAY at the SMITHFIELD SHOW



A general view of the Gas Council stand at the Smithfield Show and Agricultural Machinery Exhibition, Earls Court. On the right is a model of the Slade Curran grass dryer, on the left domestic gas appliances and in the background gas equipment for the dairy.

IN two successive years a shadow has been cast over the Smithfield Show. Last year it was foot-and-mouth restrictions which destined every livestock entry for slaughter at the end of the show, thus causing the withdrawal of many entries. This year our capricious climate staged one of her now happily rare 'London particulars' which led to the death of a number of valuable beasts from respiratory disorders before the Show had well begun.

Notwithstanding this unfortunate start, the exhibition at Earls Court the week before last seemed better than ever, providing as it does, in addition to the fatstock entries, a 'shopwindow' for all that is latest and best in agricultural plant and equipment. It is particularly fitting, therefore, that the Gas Council should participate in an event of such importance with the object of reminding the farmer how wide a service gas can offer to the country's major industry.

The Gas Council stand occupied the same site as last year and was, in fact, almost identical in design and in the equipment displayed—which included, on the commercial side, pasteurisers, steam-raising boilers and storage sets, and, on the domestic side, water heaters, wash boilers, cookers, and refrigerators, together with a number of gas and coke heating appliances.

A New Ham Cooker

Most of these appliances are too well-known already to call for individual mention—so we will confine our comments to one piece of apparatus which is new to the industry. This is a ham cooker by J. Stott & Co., Ltd. (model H/G. 1, No. 4) which by the use of a thermostatically controlled steaming oven ensures ham production without any variation in the condition of the cooked product. About 12% in weight of ham is claimed to be saved by steaming instead of boiling, essential vitamins are preserved and the cooked ham is of better quality, finer in both taste and appearance. There is also considerable fuel economy and labour saving in the use of this appliance, particularly as an automatic time clock can be fitted to cut off the cooking at a pre-determined time. The cookers can be manufactured to take any quantity from four to 200 hams at a time.

We were pleased to see again at this Show the model grass and grain driers which have been used on previous occasions. These are examples of the Slade Curran and I.C.I. equipment, both of which have now been in operation long enough to prove their merit and establish their position in the agricultural world, more particularly in view of the greater emphasis which is now being placed on modern grass farming methods. Our principal criticism is that even the smallest grain drier of this type in current production still represents far too high a capital outlay for the average dairy farmer and cannot yet compete in price with silage making.

Heat Storage Appliances

In our review of the Dairy Show last October we commented on the tendency to display on gas stands at exhibitions appliances of the 'heat storage' type among the coke burning equipment and questioned the wisdom of such exhibits inasmuch as they are capable of using any kind of fuel and as often as not do not use coke at all but more frequently anthracite. We were therefore sorry to note yet again on the Gas Council's stand at Earls Court an example of this type of appliance.

As a whole the gas exhibit at the Smithfield Show maintained the high traditions of standcraft which have come to be associated with Gas Council displays. It provided a good cross-section of appliances and avoided over-crowding (which, incidentally, was a fault of many other stands at this exhibition—though admittedly a gas boiler is an easier thing to display on a limited site than, say, a combine harvester or a 30 ft. elevator). We regretted that insufficient attention was given to that important side line—agricultural fertilisers; and in this connection we think it is high time that greater emphasis was placed at exhibitions of this kind on the direct application of ammoniacal liquor as a valuable form of nitrogenous fertiliser. Following the experience gained in this direction in various parts of the country, all Gas Boards should by now be in a position to offer this useful service to agriculture—and one of the best ways of drawing attention to it is through the medium of agricultural shows, at which a technical expert should be in attendance to explain the system to farmers.

To complete our record of the Show we give below a complete list of the apparatus displayed:

Gas Domestic Equipment	
Master Gas Cookers, Ltd.	M.24 cooker
Sidney Flavel & Co., Ltd.	68/16 cooker
Bolton Metal Products, Ltd.	G.50 washing machine
W. H. Dean & Son, Ltd. ..	927 wash boiler
Radiation Group Sales, Ltd.	S.12/2 storage water heater
Ewart & Son, Ltd. ..	M.210 M/P water heater
Ascot Gas Water Heaters, Ltd.	SG.32/1 bath water heater
" " "	503/3 sink water heater
John Harper & Co., Ltd. ..	3161 radiator
Electrolux, Ltd.	L.300 refrigerator
Coke Equipment	
Rbt. Taylor & Co. (Ironfounders Sales), Ltd.	41.M Tayco boiler
Smith & Wellstood, Ltd. ..	Esse Fairy No. 3 cooker with new stoking bar and damping grate
Allied Ironfounders, Ltd. ..	No. 3 Otto stove
Commercial Gas Equipment	
Controlled Flame Boilers, Ltd.	3.S steam raising boiler
T. Guisti & Son, Ltd. ..	25-gal. gas-fired pasteuriser
" " ..	50-gal. steam heated pasteuriser
Prestone Cookers, Ltd. ..	Prestone 10-gal. pressure cooker
Thos. de la Rue & Co., Ltd.	Empire No. 2 lagged storage set
J. Stott & Co., Ltd. ..	H.G.1 ham cooker No. 4
Commercial Coke Equipment	
I.C.I., Ltd.	Model grain dryer
Slade Curran & Co., Ltd.	Model grass dryer

Distribution of Gas in Hawick during the cold spell was 20% higher than normal for the time of the year, and actually 5% higher than any previous recorded output for the works. The works at Hawick are under some strain in cold weather, especially as the completion of the new main which is being laid has been held up for lack of piping, with the result that distribution to some parts of the town is affected. Lunch hour gas demand is very high because so many women rush home from the mills and factories to prepare a quick meal.

Price Margin on Gas Appliances

'Nothing to do with Cost of Fixing'

FURTHER consideration was given at a meeting of the South Eastern Gas Consultative Council on December 2, at the Caxton Hall, Westminster, under the Chairmanship of Councillor A. B. Constable, to a recommendation from the Kent County District Committee on behalf of the Sittingbourne Co-operative Society for a review of the Board's bread-baking tariff schedule. The Council agreed to recommend that direct consultation between the Board and the consumer would be desirable.

Central Heating

Dealing with a complaint from a consumer regarding terms and conditions appertaining to the Board's central heating tariff discount, the Council received recommendations from certain district committees that the Board's published schedule should include some reference to the requirement that the cost of installing a separate meter where necessary was chargeable to the consumer. It was agreed to submit a recommendation to the Board.

It was reported that additional appointments to the Council, with a view to restoring its numerical strength in accordance with the terms of the Gas Act, were still under consideration of the Ministry of Fuel and Power.

Information had been received from the South Eastern Gas Board that arrangements had been made for interchange of facilities for display of appliances and payment of accounts at the Electricity Board's showroom at New Romney, and that of the Gas Board at Sandwich.

The Council agreed to forward a recommendation to the Ministry of Fuel and Power that consideration be given to a review of the prevailing restrictions on promotional advertising as applied to the gas and electricity industries in view of the disadvantageous position of the gas industry in the matter of facilities for the sale of appliances.

A Combined Meeting

A combined meeting of the Council and its six district committees was also held on December 2, to hear an address from Mr. R. S. Johnson, M.B.E., Deputy Chairman of the South Eastern Gas Board, on the Board's third annual report and accounts.

Having summarised the main features of the report, Mr. Johnson referred to the adequacy of the Board's plant to meet the winter demand for gas. The report stated that the shortage of steel was hindering the carrying out of plans for replacing old plant by new manufacturing plant built on selected sites. Although the Board was distributing steel to the best advantage, and thus enabling the most urgent schemes in the area to be completed first, the shortage would mean that other schemes had to be held up for a longer time. The report then said that this slowing up of the construction programme might make it difficult to maintain supplies to consumers if there should be several days of continuous cold weather in coming winters. This had been interpreted in some of the Press reports to mean that there was an immediate shortage of gas for the winter which was now upon us. There might be a few local difficulties still unsolved, but in general the present position was satisfactory. It was only if they had a prolonged spell of really severe weather that they expected any serious difficulty.

Steel was required for new plant which would be brought into operation in the next three or four years.

Since vesting date costs outside the control of the Board—mainly for raw materials and wages—had risen by about £6 mill. a year. Higher prices for coke, tar, etc., had brought in £1,400,000 a year leaving £4,600,000, equivalent to 4d. a therm of gas sold, still to be found. Increases made in the price of gas since vesting date were estimated to produce an average of 2¼d. a therm so that it had been possible to save extra costs of 1¼d. a therm from being passed on to consumers. This saving was partly due to economies and improvements in efficiency and also reflected the fact that the Board was now working on a narrower margin of revenue and expenditure than was customary in the gas industry before.

Joint Consultations

A feature of the year was the formation of joint consultative committees. The Board realised how much it depended on the co-operation of its employees in providing a satisfactory and economical service to consumers of gas, and it regarded these committees as a valuable opportunity of bringing elected representatives of the employees into consultation with the management. There were 57 committees covering works and districts throughout the area and 233 employees were serving on them as elected representatives. The committees had made a good start and it was hoped that they would make a valuable contribution to preserving the good relations with employees which had been traditional in the area.

Mr. Addison (Barming, Kent) enquired if the Board had any observations to make with regard to a recent Press article addressed to the Chairman of the Gas Council, relating to alleged overcharging to the public in the sale of appliances.

Mr. Johnson said that on a previous occasion the Board had been criticised for charging too little, but there was no secret with regard to the percentage normally added to manufacturers' prices. It was 37½%. The Board bought from the manufacturers, provided the warehouses and local depots, and all the mechanics of selling. It was Mr. Johnson's belief that the Board's figures were comparable with the general figures of outside industries engaged in similar business.

Mr. Lambe (Kingston), speaking of Mr. Johnson's reference to 37½% added to the cost of appliances, said that so far as he knew certain appliances were fixed free of charge prior to vesting date, but now fixing charges were being made.

Mr. Johnson replied that the Board's general policy was that services provided should be self supporting and not a burden on the price of gas. Mr. F. A. Cheeseman, Sales and Service Manager, West Surrey, added that the 37½% on the cost of the appliances had nothing to do with the fixing costs. The fixing charges and the price of the appliance had to be regarded as two separate issues.

Alderman Farrell (Worthing) enquired as to the progress of output and sales of gas since vesting date, as compared with preceding years.

Mr. Johnson said that it would be difficult to obtain this information in detail from the various undertakings operating in the Board's area prior to vesting date, but the general answer was that there had been a gradual increase in the quantity of gas sold to the public.

Councillor Mrs. Jenkins (Croydon) enquired whether the increased quantity of coke produced per ton of coal carbonised had affected the quality of coke sold to domestic consumers and if so whether the change was reflected in the price charged.

Mr. Johnson replied that the quality of the coke had been maintained and that prices were controlled by the Ministry of Fuel and Power.

B.G.S.A. Bournemouth Branch Meeting

SO MANY ATTENDED a meeting of the Bournemouth branch of the British Gas Staff Association recently that members had to stand to listen to an address given by the General Secretary of the Association, Mr. F. C. Henfrey-Smith, supported by Mr. A. D. O'Driscoll, Secretary of the Southern Area Council.

In his address the General Secretary, after discussing points raised by members relating to the recently introduced pension scheme for gas staffs, paid tribute to Mr. H. T. Symons (Chairman) and Mr. W. F. Carter (Hon. Secretary), of the Bournemouth branch, on the excellent work they had done for the Association in dealing with appeals from members and their negotiations with local management.

Mr. O'Driscoll related the activities of the Area Council from which members were elected to serve on the staff side of the Area Joint Council which negotiates with representatives of the management. Mr. Henfrey-Smith in his final remarks stated that the aim of the British Gas Staff Association was efficiency in the gas industry.

Salesmanship and Consumer Service

WE reproduce below extracts from the report of the Sales Training Committee on the Institution of Gas Engineers' examination in Gas Salesmanship and Consumer Service, together with the names of those candidates who have been awarded Certificates in this examination in 1952.

The membership of the Sales Training Committee is as follows: *Chairman:* J. H. Dyde, M.SC. *Gas Education Committee Nominees:* H. P. Lupton, B.SC., J. Tudor Rees, W. K. Tate, M.A., J. Terrace. *Gas Council Nominees:* A. B. Badger, M.A., PH.D., R. N. Le Fevre, A. McDonald, B.SC., A. B. Seton, M.B.E. *Ministry of Education Nominees:* P. C. L. Thorne, M.A., M.SC., PH.D., H.M.I., C. E. Beevers, H.M.I. *Incorporated Sales Managers' Association Nominee:* R. J. Morgan, F.C.I.S.

The Committee has considered during the year some comments which were made at the 7th Gas Education Conference and at the 17th Autumn Research Meeting, both of which were held in the autumn of 1951, in regard to the curriculum for the Institution's Certificate in Gas Salesmanship and Consumer Service.

Two Main Criticisms

It was apparent from these comments that there are two main criticisms of the present scheme. Firstly, it is felt by many who have had experience in administering the courses for the Certificate that the standard of technical knowledge required of the candidates is too wide, having regard to their daily duties and to the opportunities that are normally available to them to acquire practical experience in all branches of the distribution and utilisation of gas. Secondly, it is considered that the regulations do not make sufficient provision for ensuring that candidates will have had practical training and experience in salesmanship, with the result that some candidates, having passed all of the written examinations, fail quite badly when submitted to an oral test in which they are expected to display their ability in selling and demonstrating the operation of equipment for the utilisation of gas.

With regard to the first of these criticisms, the Committee agreed that it is unnecessary for candidates for this Certificate to have knowledge and experience in distribution technique or in the industrial utilisation of gas, both of which are generally the prerogative of engineers with some specialised training and are not normally within the field of operation of salesmen or district representatives for whom the Certificate is primarily intended.

It has accordingly been decided to request the City and Guilds of London Institute to consider a revision of the examination arrangements for the Certificate in the Technology of Gas Supply, whereby the questions for the first paper would be set upon a section of the syllabus containing those items of interest to salesmen and district representatives and the questions for the second paper would relate to the remainder of the syllabus. In this way no amendment of standard would be required of candidates for either Certificate, but candidates for the Certificate in Gas Salesmanship and Consumer Service would be required to take only the morning paper. This matter is now being investigated by the Advisory Committee of the City and Guilds of London Institute.

So far as the second criticism is concerned, the Committee hopes that Gas Boards will provide opportunities to enable candidates for the Certificate in their employ to acquire practice and experience in demonstrating gas equipment. The oral test is an essential part of the examination for the Certificate, and however brilliantly a candidate may answer the written examinations, he will have little chance of being awarded the Certificate if he is unable to demonstrate his ability as a salesman.

The Committee reports with pleasure enquiries that have been received in regard to the adoption of the Certificate in Gas Salesmanship and Consumer Service by certain gas undertakings in New Zealand. The written examinations for candidates from that country will be conducted under the ægis of the City and Guilds of London Institute and the Institution at centres arranged in New Zealand, and the oral examinations will be conducted by responsible officials of the gas undertakings in New Zealand, in accordance with general principles determined by the Institution.

Better Standard Achieved

The Committee decided to appoint the same examiners as last year (Mr. C. C. Knights and Mr. S. A. King) to conduct the written examination in the Principles and Practice of Gas Salesmanship and to ask the assistance of the Gas Boards in regard to oral examinations. The number of candidates for the examination was exactly double that of last year, there being a total of 80, comprising 34 external candidates and 46 entered by five technical or commercial colleges. The standard achieved was considerably better than last year, there being a percentage of first class passes of 17.5 against 2.5 and a percentage of failures of 13.7 against 45.0.

The examination comprised two parts, for each of which five questions were set, the candidates being invited to attempt three. The results obtained are summarised in the following table:

Class	Internal—46		External—34		Total—80	
	No.	%	No.	%	No.	%
1st ..	9	19.5	5	14.7	14	17.5
2nd ..	32	69.6	23	67.6	55	68.8
Fail ..	5	10.9	6	17.7	11	13.7

Commenting on Part A of the examination, the examiner appointed by the Incorporated Sales Managers' Association observed that the quality of the work displayed did not show up as being conspicuously better or worse than last year. The work does not compare unfavourably with that done in other examinations in which the examiner participated. The questions were clearly understood, as each question was more or less correctly answered by a number of candidates.

The standard of English was rather higher than one expects from this class of candidate today, but this is not very considerable praise because the standard of English generally displayed by young persons is much lower than before the war. There were, of course, a number of candidates who endeavoured to mask their inability to answer a particular question by inserting irrelevant material. It cannot be stressed too much or too often that this practice earns no marks.

Following is the list of candidates who have been awarded the Certificate in Gas Salesmanship and Consumer Service of the Institution of Gas Engineers in 1952:

Class	*Name*	*Town*
First	Dodge, J. C. R.	Hayes, Middlesex
,,	Kemp, G. H.	Enfield
,,	Mealey, S. A.	London
,,	Monk, A. W.	Croydon
,,	Parsons, A. G.	Ilford
,,	Pye, L. G.	London
,,	Saxon, J. W.	Burnley
,,	Tipple, R. H.	Isleworth
Second	Biggs, E. W. H.	Worthing
,,	Brundrett, D. E.	Purley
,,	Driver, F. J.	Cambridge
,,	Edwards, J. A.	London
,,	English, R. F.	London
,,	Green, V. J.	Portslade
,,	Grinyer, L. C.	Brighton
,,	Harwood, H. R.	London
,,	Hunt, C. T.	Welling
,,	Jackson, F.	London
,,	Mewes, A. V.	London
,,	Morrison, J. G.	Edinburgh
,,	Newman, R. L.	Rainham
,,	Peacock, W. A. J.	Dagenham
,,	Thorp, P. W.	Romford
,,	White, R. W. D.	Edinburgh
,,	Wood, R. W.	Rustington

Kitchen Fashions

THE dress show which Queen Elizabeth the Queen Mother saw at the International Kitchen exhibition in London last month has been re-enacted at Liverpool to enable the ladies of the Liverpool group of the North Western Gas Board to see the actual dresses shown in London.

Four charming models were on parade at Radiant House, Liverpool, on November 19 and 20 and gave four shows admirably compered by Madam Lucia Rogers. In addition to the more orthodox overalls and house dresses, some ingenious plastic protective cuffs, anklets, and aprons caught the imagination of the audience, and in lighter vein, a house-coat and a waist-coat-cum-apron for the mere male were also shown. These were provided by the Gas Council, and some additional gowns and housecoats were provided by a local department store.

The latest gas appliances were also on display and provided an effective background, a short talk on these appliances serving as an introduction to the dress show itself. The Liverpool display was arranged by Mr. C. H. Leach, Group General Manager.

A CALORIMETER SAFETY DEVICE

By W. J. RICE and J. SEWELL,
Southend Works, North Thames Gas Board.

THE apparatus described in this article has been evolved for use on Fairweather recording calorimeters where a multi-point recording unit is in use in conjunction with thermocouples. It has the advantage of simplicity, is easily made, and requires little attention. The object of the device is twofold. First, to shut off the gas supply in the event of the burner being extinguished and so prevent unburnt gas passing in to the test-room. Secondly, to shut off the gas supply if the water system fails. This supplements the existing water bucket safety mechanism.

The apparatus consists of two parts. One is a V-shaped glass tube, in which are fused four platinum wire terminals over which mercury can pass, thus opening or closing electrical circuits. The second is a solenoid plunger, so arranged on the side of the meter casing that it can strike a number of blows on the bucket arm until it releases the safety cock. Attached to the gas cock is a mercury switch, which ensures that all current is cut off as soon as the cock operates.

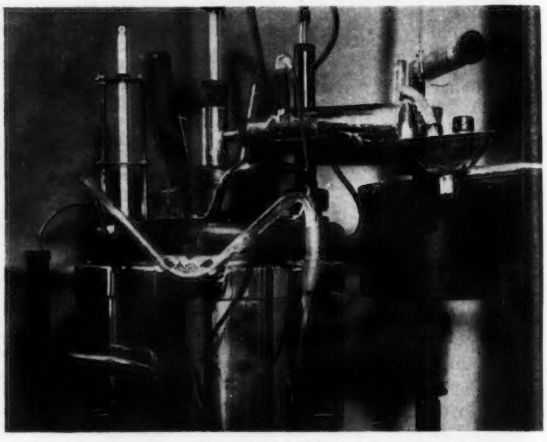
A ¼-in. copper coil consisting of approximately 20 1-in. turns is enclosed in a jacket of the same metal. The warm water from the heat exchanger is led through this jacket. One end of the coil is sealed and the other is connected to the V-shaped glass tube of about 6mm. diameter, referred to above. Mercury in this tube moves up or down with any expansion or contraction of the air trapped in the copper coil.

The volumes of air and mercury are arranged so that under normal working conditions contact is maintained between the two appropriate platinum points.

If the burner becomes extinguished the temperature of the water from the heat exchanger drops, the air contracts, and the mercury moves so that the meter escapement circuit is opened and the meter stops. As the mercury continues to move it closes the plunger circuit which is actuated by the control clock. This circuit operates a solenoid plunger energised at one-second intervals at the tip bucket arm until it releases the weight-controlled gas cock, to which is attached a mercury switch that opens the main circuit.

Should the water supply fail, the rising temperature causes the mercury to close a second circuit to the solenoid plunger, which again operates as already described. For re-starting, two switches are provided, one to close the meter circuit, the other to open the plunger circuit until the mercury control has taken over.

The apparatus, which is in use at the Southend works of the North Thames Gas Board, is simple to set up. Adjustment to the quantity of trapped air can be made by passing a thin rubber tube through the column of mercury. The use of a small aneroid bellows is very suitable for making small additions in this way.



A small piece of cotton wool just inside the copper connecting pipe on the air vessel ensures that no mercury, if accidentally spilt, will find its way to the copper coil. A pellet of calcium chloride placed on this cotton wool maintains dry air with advantage.

The authors thank the North Thames Gas Board for permission to publish this note.

UNITED NATIONS SCIENTIFIC CONFERENCE

THE United Nations Scientific Conference on the conservation and utilisation of resources—known briefly as Unsccur—which met in 1949, brought together over 700 scientists from 50 countries to discuss and consider more than 500 scientific papers. The primary concern of the conference was with the practical application of science to resource management and use rather than with refinements in research and scientific methods. The Unsccur programme was divided into six major sections corresponding to the principal resource fields—minerals, forests, fuels and energy, water, land, and fish and wildlife resources. In addition there was a series of plenary meetings which considered the broader problems of resource development and which also served to give a common spirit and purpose to the entire conference.

The full text of the papers and records of discussions are now available in the complete Proceedings of Unsccur in eight clothbound volumes. All the volumes except Vol. VIII (the index) are obtainable in English editions. The volume in which we are more particularly interested is Vol. III—Fuel and Energy Resources. Comprising 333 quarto pages, the volume includes sections on coal mining, coal preparation, underground gasification, coal carbonisation, and conservation in utilisation of fuel for space heating. There is also a paper on the heat pump as a conservation device. Contributors to the coal carbonisation section include D. Hicks, Director of Scientific Control, National Coal Board; G. W. Lee, Director of the British Coke Research Association.

Vol. III is obtainable from the Stationery Office in London, Belfast, Birmingham, Bristol, Cardiff, Edinburgh, and Manchester at 22s. 6d. ($3).

C.O.M.A. YEAR BOOK

THE COKE OVEN MANAGERS' ASSOCIATION has published its *Year Book* for 1952—the 33rd produced in successive years by the Association. While it follows closely the pattern of recent editions it has been found possible to modify and extend many of the matters of general information and add to its value as a book of reference. By the end of September, 1951, the membership of the Association, including 18 Honorary Members, had reached a total of 501. Besides giving a complete list of members and particulars of coke oven plants in Great Britain and abroad, the *Year Book* covers the transactions of the main Association and its three home sections.

The editorial committee has again produced a book of much value to all engaged in or connected with the carbonising industry. The technical papers and discussions are as usual of a high order, and thanks are expressed in the preface to all who contributed during the year either as authors of papers or in the discussions. The circulation of the *Year Book* continues to increase, and requests are received from all the industrial countries of the world.

BASED ON COAL DEPOSITS near Albertville, an oil from coal enterprise in the Belgian Congo is to be financed by the Union Chimique Belge (40% of the capital), the Union Minière du Haut Katanga (20%), the Société Geomines (20%), and the Comité Special du Katanga (20%). An eventual annual production of 100,000 tons of oil is expected, but in view of the low quality of the coal available, a trial plant will be constructed first to determine the best method of distillation.

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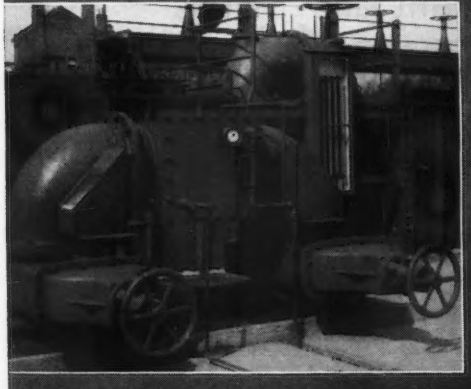
ILLUSTRATED BELOW
Enlarged view showing
Preheater and instruments



ILLUSTRATED ABOVE
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B.W.

TOWN GAS INTERCHANGEABILITY

and the Flame Hardening and Tempering of Wire

By
A. R. WILSON, B.Sc.,
Technical Assistant, Industrial Research and Development Section, North Eastern Gas Board.

From a paper to the Manchester and District Section of the Institution of Gas Engineers, Autumn Meeting, November 14, 1952.

IN the heavy woollen district of Yorkshire is concentrated an industry for the production of the card wire used extensively in the manufacture of textiles. The use of steamed vertical retort gas for the process is traditional, but the erection of C.W.G. plant in this area is expected to result, during the next two years, in the supply to the wire manufacturers of gas containing, firstly, 30% and later 50% C.W.G. The purpose of the investigation described herein was to determine the effect on the process of this major change and of the day-to-day changes in gas composition occasioned by the economic operation of the gas producing plant. Of secondary interest was the possibility of increasing the thermal efficiency of the flame hardening process by the use of burner radiants.

PART I.

EFFECT OF CHANGES IN TOWN GAS COMPOSITION ON THE EXISTING PROCESS

The Flame Hardening and Tempering Process

Flame hardening and tempering of bright plain carbon steel wire is effected in two consecutive operations on a frame of which a general view is shown in Fig. 1.

Fig. 1.

The coil of wire, carried on a free running spool or swift at one end of the frame, is unwound and drawn the full length of the frame at a speed dependent on its gauge. During its travel the wire, tensioned by friction pads, is guided through the outer envelopes of the flames of a pin hole burner. In so doing it attains a bright red heat before passing from the flame immediately into an oil bath, where it is quenched.

On emerging from the quenching bath, the wire is cleansed of superfluous oil and is then tempered by heating to approximately 350°C. This may be effected either by open flame heating or in a lead bath heated directly by gas burners. An oil or air quench of the new hardened and tempered wire completes the process.

The Criterion of Heat Treatment

With the proposed supply of C.W.G.–V.R.G. mixtures it was considered necessary to determine the effect upon the process of changes in town gas composition. Undoubtedly the most conclusive and informative results would have been obtained by the application of industrial tests to the wire following its heat treatment using, firstly, vertical retort gas and, secondly, V.R.G.–C.W.G. mixtures. This would clearly have been carried out most conveniently by skilled frame operators on the wire manufacturers' premises, but this direct method proved impracticable for several reasons, the main one being the interference with production.

This point having been decided, the nature of the tests to be conducted remained. For acceptance by the card and heald manufacturers, the hardened and tempered wire must be bright in appearance, free from 'set' and possess certain critical but undefined mechanical properties. Any departure from these standards would be intolerable, but unfortunately the industrial tests applied to the wire are carried out by hand and call for a degree of skill acquired only through long experience. Such tests are clearly not reproducible and in consequence it was not considered profitable to conduct empirical tests on the wire since neither the ideal results nor the permissible departures from these ideal values could be established.

As an alternative the temperature of the wire was accepted as a criterion of heat treatment. Since the use of town gas is confined to the heating operations of the hardening and tempering processes, any effect due to a change in gas composition would be limited to those operations where a change in temperature of the wire would be experienced. The method now adopted assumed that if, regardless of different conditions of gas composition, the temperature of the wire leaving the flame was constant, then the conditions prerequisite to correct heat treatment had been achieved. If, on the other hand, the differences in temperature in successive tests were measurable, it should be possible to state whether these differences would be likely to impair the properties of the wire. Conversely, it might be possible to define the permissible limits of variation of gas composition from a particular mean.

For the execution of the proposed tests a wire hardening frame was erected and, since it was not proposed to test the physical properties of the wire, its construction was of a simpler form than the industrial frame shown in Fig. 1. The tempering section and the first oil quenching bath were omitted as unnecessary and, indeed, incompatible with the use of instruments for the measurement of wire temperature. The frame was modified extensively in the light of experience until it reached its final form as shown in Fig. 3.

The Determination of Wire Temperature

Following the choice of wire temperature as a criterion of heat treatment, the development of a technique of measuring the temperature of a hot moving wire was undertaken. The need of a thermopile was recognised from the first but, at the commencement of the investigation, there was no prospect of obtaining one. In the interval and solely because of the lack of this instrument, other methods less suitable for the rapid and accurate measurement of wire temperature were employed.

In one such method, the temperature of a small electric furnace mounted behind the wire was adjusted until the wire emerging from the flame was invisible against the background of the interior of the furnace. Thereupon the temperature of the furnace was determined by means of an optical pyrometer. The method, however, was inevitably slow in operation and for this and other reasons was therefore abandoned.

Subsequently a photo-electric cell was used with some success to measure the intensity of energy radiating from the hot wire. Such was the sensitivity of the cell, however, to the small but frequent fluctuations in the temperature of the wire as it left the burner that the galvanometer used in connection with the cell never reached equilibrium. Consequently, accurate readings were unobtainable and since, at this point, the loan of a thermopile was secured, the development of the photo-electric cell method was discontinued.

EXPERIMENTAL CALIBRATION OF THE MOLL MICRO-THERMOPILE.

The relation between the temperature of a hot body and the energy emitted is stated in the Stefan-Boltzmann law:—

$$E = K(T_1^4 - T_0^4)$$

where E is the energy interchange between a hot body at an absolute temperature T_1 and an instrument at a temperature of T_0, K being a constant.

For all practical purpose this expression can be simplified to:

$$E = KT_1^4 \text{ or } E \propto T_1^4$$

without the introduction of any appreciable error, for if T_1 is large compared with T_0, then T_0^4 becomes negligible in comparison with T_1^4.

An ideal radiation pyrometer, then, would give galvanometer deflections proportional to the fourth power of the absolute temperature of the radiator. Where commercial instruments are concerned, however, the indices are found to vary usually between 3.8 and 4.2. An individual calibration of the Moll thermopile was therefore necessary and, by means of a slowly-cooling furnace, an index of 4.16 was determined.

Sufficient Confirmation

The calibration was repeated and a second value of 4.14 was obtained. This was considered sufficient confirmation of the original 4.16 and a mean value of 4.15 was applied in subsequent calculations of wire temperature.

Following its calibration, the thermopile was mounted on the experimental wire hardening frame inside a water cooled jacket designed to shield the thermopile from all extraneous radiation.

To relate the readings of the galvanometer, used in conjunction with the thermopile, to a temperature scale, it still remained to observe one reading corresponding to one particular, accurately determined, wire temperature. The application of an optical pyrometer to the measurement of the temperature of a fine, bright steel wire under non-'black body' conditions was not to be recommended. It seemed possible, however, to use the Curie temperature as a calibration point since it can be shown that for all practical purposes, the ferromagnetic properties of 0.75% carbon steel are undetectable at temperatures above 730°C.

To detect ferromagnetism in the wire a small magnetic balance was constructed to fit inside the water jacket. Wire was then drawn along the frame at a temperature such that very small variations, due to mechanical imperfections of the frame, caused the beam of the balance to 'see-saw.' This condition was produced in seven successive tests and the mean galvanometer reading, corresponding to the wire temperature of 730°C. thus obtained, was determined as 93.6 with an average error of 0.26.

The expression $E = KT^{4\cdot15}$ had already been determined and, with the calibration of the thermopile-galvanometer system at one known wire temperature, the temperature corresponding to any particular galvanometer reading could now be calculated. A graph relating wire temperature to galvanometer reading is shown in Fig. 2.

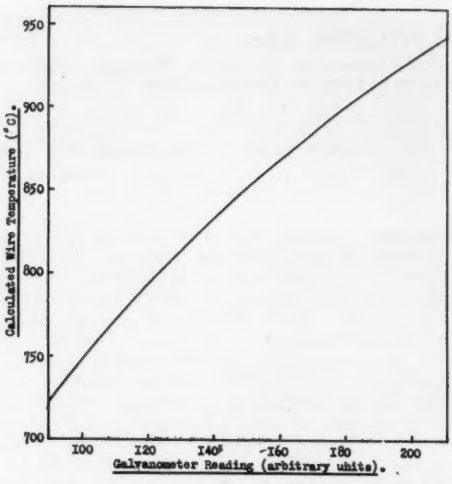

Fig. 2.—Wire Temperature-Galvanometer Reading Calibration Curve.

Experimental Determination of Town Gas Interchangeability

Following extensive modifications the experimental wire hardening frame reached its final form as shown in Fig. 3, and, with the calibration of the instruments, the apparatus was now available for testing the interchangeability of V.R. gas and C.W.G. of equal C.V.

Accordingly, each gas in turn was supplied to the frame and, with a constant supply of primary air, the gas rate was varied progressively and the resulting wire temperature noted. The mean results of duplicate tests are shown in Fig. 4 in which intermediate curves were interpolated to represent mixtures containing 30% and 50% C.W.G. The dotted portions of the curves denote the ranges of air/gas rates not normally used in the wire industry.

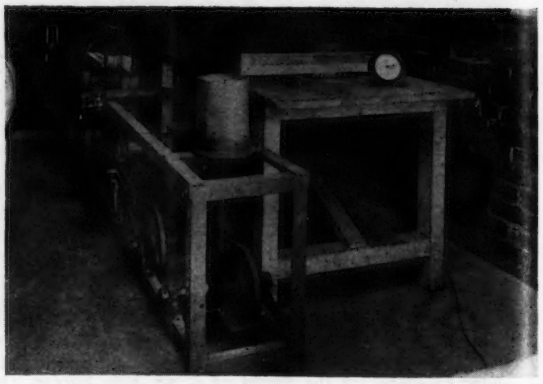

Fig. 3.

From these curves it was apparent that, if the change from V.R.G. to C.W.G. and *vice versa* involved no change in gas flow, then the resulting change in wire temperature would not exceed 15°C. The flow of gas through a pipe, however, is known to vary inversely as the square root of the density of the gas. Consequently, the substitution of C.W.G. (S.G.= 0.65) for V.R.G. (S.G.=0.47) would be expected to result in

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the discharge of only 84.4% of the original volume. This value was confirmed by an experimentally determined 84.9%, the small discrepancy being attributable to errors in determining the specific gravity of the gases.

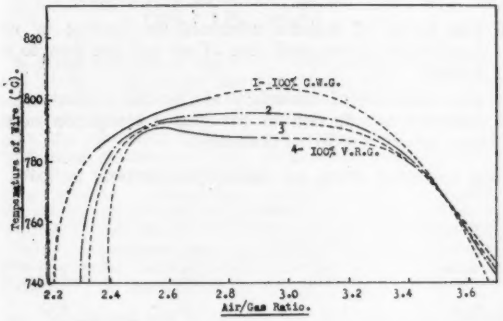
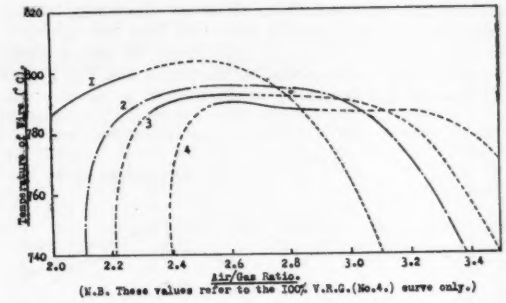
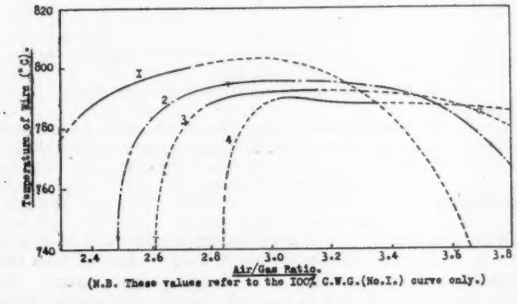


Fig. 4.—Diagram showing the variation in wire temperature with complete interchange from V.R.G. to C.W.G. Curves 2 and 3 assumed to represent mixtures containing 50% C.W.G. and 30% C.W.G. respectively, are interpolated.

For the reasons stated above it was considered, therefore, that Fig. 4 did not truly represent the changes in wire temperature and burner stability occasioned by a change from V.R.G. and accordingly Figs. 5 and 6 were constructed with due regard to the effect of specific gravity.





Figs. 5 and 6.—These diagrams show the change in wire temperature following a change, in Fig. 5, from V.R.G. to a mixture with C.W.G. and, in Fig. 6, from C.W.G. to a mixture with V.R.G. The conditions of gas composition and air/gas ratio producing a flame of the type favoured by the wire industry are shown by continuous lines.

In Fig. 5 all other curves are drawn relative to the '100% V.R.G.' curve and the wire temperature following a change from vertical retort gas to a mixture with C.W.G. is found by moving vertically from any chosen point on the base curve to meet the curve representing the particular mixture. Fig. 6, although similar, is based on the wire temperature—air/gas ratio curve for 100% C.W.G.

Conclusions

From the foregoing the following conclusions were drawn:

1. From Fig. 4 it was apparent that, provided the gas and air rates were maintained constant and the air/gas ratio was not less than 2.5/1, the temperature of the wire would not vary greatly if the two gases were interchanged.
2. Because of the difference in specific gravity of the two gases, the substitution of one for the other led automatically to a change in air/gas ratio.
3. Hence, the supply of a mixture containing C.W.G. in place of 100% V.R.G. would result in a small increase in the temperature of the wire, together with a shortening and hardening of the flame.
4. Conversely, the reverse change, involving a reduction in the C.W.G. content, might well lead, depending on the original air/gas ratio, to a sharp fall in temperature due to the elongation of the inner cones of the flame to such an extent as to envelop the wire.
5. This latter change is obviously the more critical and the limits of interchangeability will therefore be defined by the extent to which the C.W.G. content of the gas can be decreased before the consequent elongation of the inner cones becomes excessive.
6. A comparison of Fig. 4 with Figs. 5 and 6 showed that the only major difference between the two gases was due to a difference in specific gravity. It was therefore concluded that changes in gas composition leading to the same percentage change in specific gravity were equally significant. Hence, it is expected that, should a mixture of C.W.G. and V.R.G. be ultimately supplied as base gas, the limits of interchangeability will widen slightly as the C.W.G. content of the base gas is increased.
7. The term 'limit of interchangeability' refers to the maximum change in the C.W.G. content of a mixture with V.R.G. which can be made, following the adjustment of a burner to ideal conditions, before some effect inhibitive to correct heat treatment occurs. It implies that no further adjustment of the burner would be made during the change in gas composition which, under industrial conditions, would be gradual. Indeed, should such adjustment be made the expression becomes meaningless, for under these conditions C.W.G. and V.R.G. are completely interchangeable. It is considered that, although large changes in composition will affect the wire industry, the effect of such changes can be offset and the ideal condition restored by suitable operation of the gas controls. The practical limits of town gas interchangeability will, therefore, depend ultimately on the vigilance and skill of the frame operators.

PART II.

THE DEVELOPMENT AND APPLICATIONS OF BURNER RADIANTS

Probably the most severe criticism of open flame hardening of wire arises from the excessive gas consumption but a second is due to the susceptibility to cross-draught. To improve the process in both respects, the development of burner radiants was undertaken.

Essentially, it was proposed to enclose the open flame between side walls of some refractory material which, while excluding draught, would be raised to incandescence by the action of the flame and so reduce radiant heat loss from the wire.

With regard to its industrial application, it was considered that a well-designed radiant should be:—

(1) refractory — to withstand flame action without failure.

(2) robust — to withstand mechanical impact during removal to permit cleaning of the burner.

(3) simple — to reduce the possibility of damage during handling.
(4) inexpensive — for cheapness of replacement.
(5) small — to minimise thermal capacity.
(6) insulating — to attain working temperature in the shortest time.
(7) self-locating — to render modification of existing frames unnecessary.

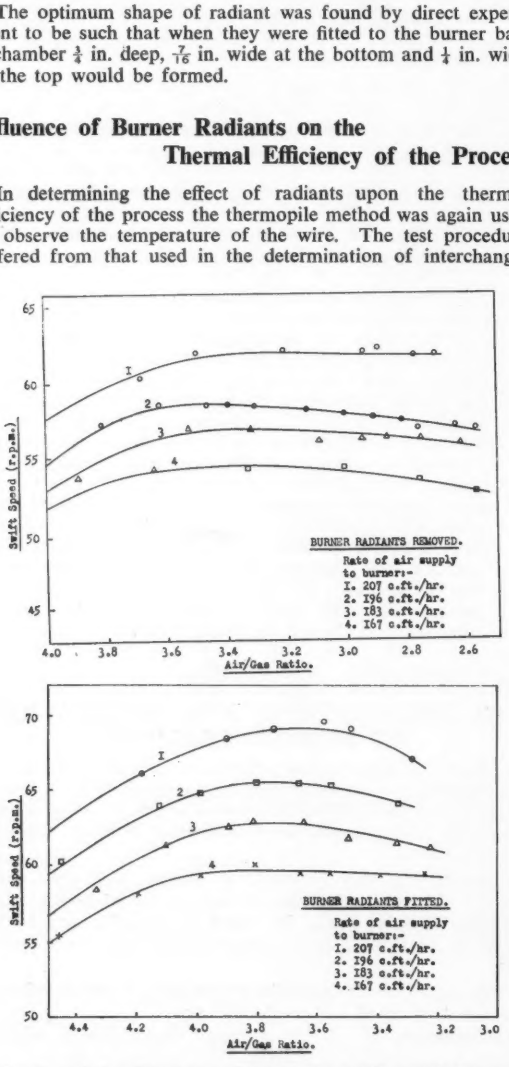
Furthermore, it should be so shaped and positioned relative to the flame as to attain the highest possible temperature. Finally, it should be sufficiently shallow, consistent with process efficiency, to permit observation of the wire during its passage through the flame.

All these requirements, with the possible exception of the last, were incorporated in the design of the prototype burner radiant, conditions 1, 2, 4 and 6 being fulfilled by the use of firebrick or sillimanite. Since the use of a shallow radiant was incompatible with high thermal efficiency, a compromise was reached and a depth of radiant of $\frac{3}{4}$ in. was chosen.

The optimum shape of radiant was found by direct experiment to be such that when they were fitted to the burner bar, a chamber $\frac{3}{4}$ in. deep, $\frac{7}{16}$ in. wide at the bottom and $\frac{1}{4}$ in. wide at the top would be formed.

Influence of Burner Radiants on the Thermal Efficiency of the Process

In determining the effect of radiants upon the thermal efficiency of the process the thermopile method was again used to observe the temperature of the wire. The test procedure differed from that used in the determination of interchangeability in that the variable speed device was adjusted to obtain always a constant wire temperature, the variation of wire speed with gas rate being noted. The immediate test results were expressed graphically in Figs. 7 and 8.



Figs. 7 and 8.—Diagrams showing the swift speed necessary to maintain constant wire temperature with variation in the gas supply to the burner, expressed as air/gas ratio, both with and without burner radiants.

From these the following conclusions were drawn:

1. The fitting of radiants permitted an increase in wire speed under given conditions of air and gas flow to the burner.
2. The exclusion of secondary air by the radiants made necessary a reduction in gas rate if elongation of the inner cones was to be prevented.

These combined effects are shown quantitatively in Table 1.

TABLE I.

Air Ratio (cu. ft./hr.)	Incr. in effic. due to necessary reduction in gas rate to maintain burner stability (%)	Incr. in effic. due to radiation from radiants (%)	Total increase in thermal efficiency (%)
170	23.8	11.0	34.8
180	23.8	10.2	34.0
190	23.8	9.0	32.8
200	23.8	8.0	31.8

Influence of Burner Radiants on Town Gas Interchangeability

Radiants were fitted to the burner and, to offset the expected rise in temperature of the wire, the swift speed was increased from 59.2 to 64.1 r.p.m., corresponding to an increase in wire speed from 2.06 to 2.24 ft./sec. The test procedure, however, was identical in every respect with that followed during the earlier determination of interchangeability. As before specific gravity corrections were applied to the results and Fig. 9 shows one of the two graphs finally produced.

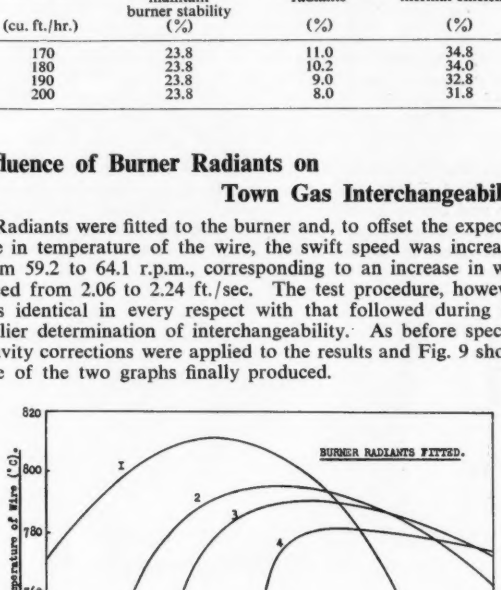


Fig. 9.—Diagram showing the change in wire temperature following a change from C.W.G. to a mixture with V.R.G.

Conclusions

Table 1 shows that the use of burner radiants can lead to an increase in thermal efficiency of 30%-35%, but of this only one-third can be attributed to their radiant effect. The remainder is merely due to the reduction of gas supply necessary to prevent the elongation of inner cones caused by the exclusion of secondary air from the base of the flame. Should, however, their use and the shorter, harder flame associated with them be acceptable to the wire industry, then an increase in thermal efficiency should result and the effect of cross draught should be eliminated.

At this stage, the development of radiants cannot be regarded as complete, and further work might profitably be undertaken. Meanwhile, it must be acknowledged that radiants, in their present form, aggravate rather than mitigate the effect of a change in gas composition. While a quantitative examination of the graphs shown previously would not be profitable, the effect of radiants on town gas interchangeability can best be seen by a comparison of Fig. 6 with Fig. 9. It would seem,

therefore, that radiants should be employed where a supply of gas of reasonably constant composition is available, or where operators have learnt by experience to overcome the difficulties arising from the interchange of town gas.

DISCUSSION

Mr. A. Higgs (Industrial Engineer, North Eastern Gas Board) said that while it was to be regretted that a positive solution in the way of automatically compensating for variations in specific gravity had not yet been evolved or other means of increasing the operating latitude, the author had been able to afford some guidance on the permissible inter-mixing of gases without adversely affecting the wire hardening and tempering process. Excepting specific gravity variations, however, there was another factor which effected the efficiency of operation of the higher temperature industrial applications and to some extent the lower temperature applications and that was the variations in air requirements per cubic foot, of gas supplied, or the changes in actual gas composition.

If they considered one of the largest districts in the North Eastern Gas Board area where the supply is composed of vertical retort gas and carburetted water gas, the air requirements per cu.ft. of gas being fed to the district varied from 4.009 to 4.252.

In the first case the volume of products produced on the wet basis was 983 cu.ft. and 1,023 cu.ft. per therm respectively. On an industrial consumer's premises, with furnace equipment operating at 1,000°C., the use of the gas with the higher air requirement would occasion a drop in thermal efficiency of the order of 1½% by virtue of the larger volume of flue products passing away from the furnace at this temperature. In terms of money, if such a consumer took 25 mill. cu.ft. per annum, this would mean an additional cost of £90 15s. on a total bill of £6,050. This effect, of course, became more marked on higher temperature, but to some extent affected the efficiency of all applications.

Another aspect of this question to which he would refer was the apparent advantage, from the industrial aspect, of the supply of the lower C.V. gases. If they took a case of 450 C.V. as supplied from vertical retorts, again in the North Eastern Gas Board area, they found that it had an air requirement of 3.67 cu.ft. per cu.ft. of gas. Against this a 500 C.V. gas in another district had an air requirement of 4.63 cu.ft. per cu.ft. of gas. The volumes of products per therm were 967 cu.ft. and 1,072 cu.ft. respectively.

An Anomaly

On the same furnace application operating at 1,000°C. this would mean that primarily the lower C.V. gas with its lower air requirements would give an increase of 3.7% in efficiency. In terms of money, if a consumer had the choice of these two gases and was again using 25 mill. cu.ft. per annum, this would mean, by selecting the lower C.V. gas alone, a saving of £224 on £6,050. From another aspect, increasing the C.V. on any district could cause an anomaly where, at the same time, the air requirements per cu.ft. became out of step with the original requirements in that, while industrial consumers could be assured that they were receiving more B.Th.U. per cu.ft. through the meter the effect could be very largely cancelled out on high temperature applications by the additional flue loss incurred by reason of the increased volumes of air necessary for complete combustion.

There appeared to be, therefore a good deal to be said in favour of maintaining the air requirement constant and as far as practicable as low as possible per cu.ft. of gas produced for complete combustion and, secondly, grounds for thought in regard to the merits of a lower C.V. gas, always presuming that the lower air requirement would obtain. Resolving this broadly, while the consumer was always purchasing the statutory number of B.Th.U. per cu.ft. he could, from a utilisation angle, get more effective heat from a gas that required less air for complete combustion in the higher temperature industrial applications.

Mr. H. Johnston (Chief Engineer, North Eastern Gas Board). suggested that reasonable changes in gas composition could be accommodated if the skill of the operators was high enough. He felt that there was much yet to be done to correlate production with heavy demand for gas. Any tolerances for specific gravity should be wide enough to allow of economic production development. They could maintain a reasonably constant C.V. over a wide range of composition, the gas having very different air requirements and behaving very differently at the burner.

It had been suggested before that the Wobbe Index be used as a measure of gas quality instead of specific gravity, and this suggestion might, with advantage, be pursued.

All tests, as set out in the paper, were with gases of constant C.V., and he suggested that the investigations be carried further to ascertain to what extent compensation could be obtained for changes in composition by varying the C.V. While in many cases fairly violent changes in gas composition and specific gravity were unavoidable when increases in demand had to be met quickly by peak load plant operation, he felt confident that the effect at the appliance burners could in some measure be compensated for by allying with the rise in specific gravity a rise in calorific value. It was worth following up on the test bench. He had practised this in actual production with apparent beneficial results, but without qualitative evidence.

Realising that this investigation was in respect of heat treating wire at a works supplied at present with 100% C.V.R. gas and which for understandable reasons would shortly be supplied with gas containing varying proportions of C.W.G., he would have thought that there were other wire works already being supplied with mixed gas from which information on the practised control of flame could have been obtained.

Conclusions were that the practical limits of town gas interchangeability would depend ultimately on the vigilance and skill of the frame operators and the adaptability of the operators in accustoming themselves to changed conditions. The limits of specific gravity variations were dictated by economies of gas manufacture over a wide range of conditions; nevertheless it would be worthwhile extending the investigations with compensating changes in C.V.

In regard to flame control at the burners—whether the process was for heat treatment of wire or other process—it occurred to him that it would not be impossible to conceive a burner control which, with constant C.V. but changing specific gravity, would maintain reasonably constant flame cone height by automatic compensation, and so reduce the critical effect of change in cone height.

Author's Reply

Mr. Wilson, in reply, said that, in discussing the effect of variations in the theoretical air requirement of town gas on the thermal efficiency of high temperature furnaces, Mr. Higgs had put forward an argument which would appear valid provided the volume of air theoretically required for complete combustion was, in fact, supplied. Where the air supply was constant and adjusted to fulfil the requirements of one gas, then the substitution of another with higher air requirements would result in incomplete combustion and a consequent loss of efficiency more serious than the 1½% quoted. The change in furnace atmosphere which would arise under these conditions might however, be of greater importance.

In those furnace operations where a moderate degree of excess air was used, the possibility of incomplete combustion did not arise, and considering the similarity of specific heat of excess air and combustion products respectively it was not considered that, under these conditions, the thermal efficiency of the process would be materially affected.

The suggestion made by Mr. Johnston that some device might be made to ensure automatically a constant supply of gas to a burner had already been considered, though so far without success. It should be noted that the so-called constant volume governor offered no solution to the problem since it merely ensured a constant pressure drop across a given restriction. Consequently it would discharge a constant volume of gas only if the specific gravity did not vary. Nor was the pre-mixing machine of direct assistance, as it was susceptible to changes in the specific gravity of gas to the same degree. Its use, however, would permit the readjustment of the gas supply at one control point and a device might be employed in conjunction with it to give audible warning of changes in gas composition. Such a method would, however, tend to take the effective control of the wire-hardening process out of the hands of the frame operators while substituting a form of control which was not itself perfect. It could not, therefore, be recommended.

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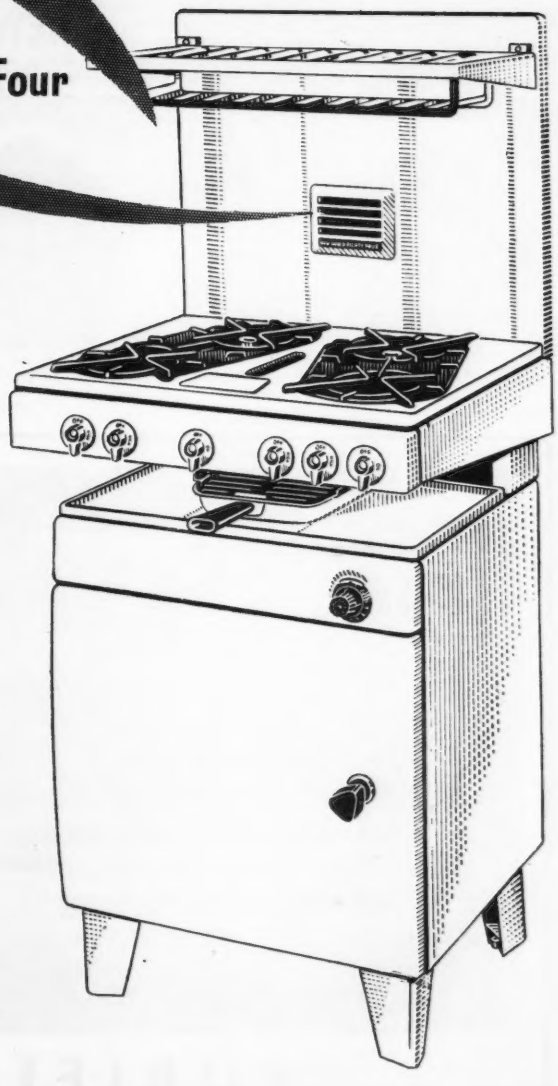

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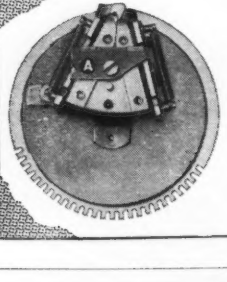


Fig. 1, on left, shows the back of the range-plate adjusted for optional coin. The swinging plate 'A' defies any attempt to insert a coin when one is already in the other slot.

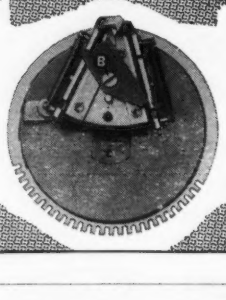


Fig 2, on left, shows the plate positioned to admit sixpences only. To make this adjustment, loosen screw 'B' and tighten it again with the plate in the new position.

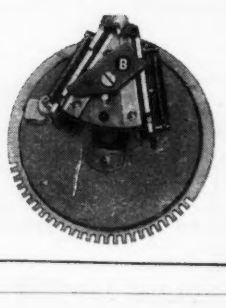
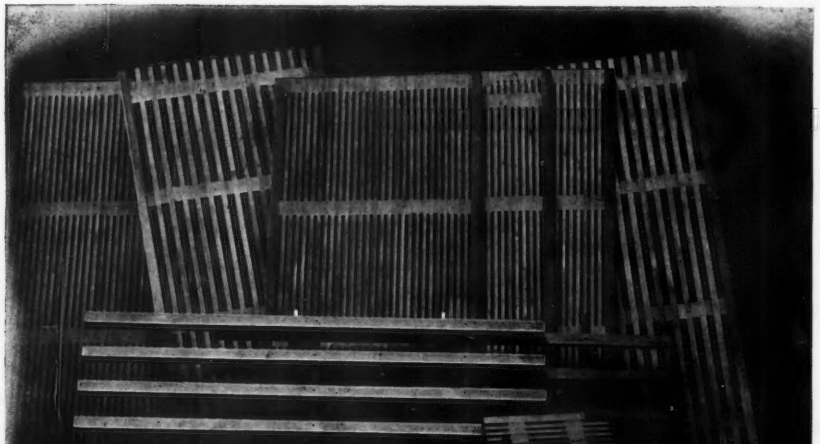


Fig. 3, on left, shows the plate positioned for shillings only. To make this adjustment, remove screw 'B', reverse the plate as shown and replace the screw.



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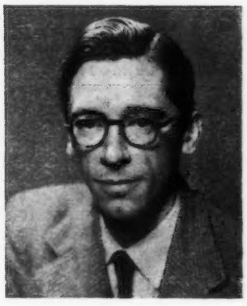

Discussion on the paper 'The Influence of Preheating the Air and Steam Supplies on the Performance of a Blue Water Gas Plant' given by G. PERCIVAL, Birmingham Research Station of the Gas Council, at the research meeting of the Institution of Gas Engineers on November 26.

MR. N. H. WILLIAMS (Humphreys and Glasgow, Ltd.) said the results showed that under the conditions of test, which had included the use of both horizontal and vertical retort cokes, there were appreciable gains, both in capacity and in efficiency, when preheating the blast and steam supplies to the hand-clinkered B.W.G. generator with which the tests were carried out. The normal difficulties of testing associated with the cyclic nature of the operation of a water gas plant were in the present case enhanced by complications of purging and by leakages of air and steam from the preheater after the point of measurement, but before reaching the generator, and in these circumstances Mr. Percival was to be congratulated on the coherence of the results which he had obtained. It is to be noted that the paper did not speak of any difficulties, as far as the generator was concerned, arising from the use of preheating.

When the tests were originally decided upon, it seemed desirable to carry them out on the smallest scale at which the results could be taken to approximate to normal full-scale performance and a hand-clinkered plant was therefore used. It was, of course, fully understood at the time that if preheating could be shown to be a practical proposition and to give improvements in operating results, then it would still remain to take the next and more difficult step of adapting a self-clinkering generator to use preheated air and steam supplies. Accordingly, consideration should now be given to this next step and to the allied question of the circumstances in which preheating was most likely to find use.

It first seemed prudent to consider whether any further information of a practical nature could be obtained from the existing hand-clinkered installation, and the test results now made available required a closer study than it had so far been possible to give them. It might, nevertheless, be interesting in advance of such closer study to indicate a few general lines of thought concerning the practical application of preheating to water gas generation.

Base Load Installation

First, Mr. Percival's results suggested that preheating might be regarded as a method of obtaining a reduced coke consumption and an increased output from a given size of plant, by further expenditure on capital and maintenance. The reduced coke consumption was accompanied by a corresponding reduction in steam production, and the extra maintenance charges would be expected to apply not only to the heat exchanger, but also perhaps to the grate and in some circumstances to the automatic charger. The question of the vulnerability of a preheater to rapid heating up when bringing a plant into commission must also be taken into account. Such considerations seemed to suggest that the application of preheating was more likely to be considered in connection with a base load installation.

Secondly, the use of preheating in connection with C.W.G. production brought the complication that passage of the carburetted gases and vapours through the preheater, in order to preheat the up-run steam, must be carried out under conditions which did not lead to fouling of the heat exchanger, for example, by condensation of tar. In this connection, it was noted that when preheating only to 400°C. with the preheater actually available at Poole it was necessary for part of the up-run gases to be by-passed round the pre-heater. The up-run gases then left at only 290°C. Of course, it would be possible to provide separate preheaters for the air and for the steam, or to use regenerators, but either of these solutions increased the complexity of the plant and added other problems.

Thirdly, unless supplementary means were provided for supplying heat to the preheater when starting up, it appeared to be necessary to provide for working with back-run when employing 600°C. preheat, and the duty on the preheater was then much easier and conditions at the grate were probably also eased. It would, therefore, appear that back-run equipment should be installed, and this would not only provided a means of dealing with the variations in the character of the ash and coke, but would at the same time simplify the design of the preheater and reduce its cost. When designing the test installation, consideration was actually given to the complete omission of back-run, since it was anticipated that, given sufficient preheat, back-run would not be necessary to maintain the hot zone at the base of the fuel column. It might be interesting to note at this point that as no mention appeared in the paper of the behaviour of the specially designed hot back-run provided at Poole, it had presumably fulfilled its function satisfactorily.

Fourthly, the practical problem of the avoidance of trouble from the presence of molten clinker at a lower point in the generator than intended should be greatly facilitated by the water seal at the base of a self-clinkering generator, but, of course, adequate insulation for the incoming preheated air and steam would be necessary.

Conditions of Test

In regard to the conditions of test, there were so many variables that it was not easy to decide on which conditions to standardise for comparison purposes. The air rate was fixed in the tests described in the paper, but the effect of variations in preheat upon the air throughout might have been looked upon as one of the ways in which preheat affected the output of the plant.

As regards steam raising, the calculations in the paper assumed that if temperatures in advance of the preheater were controlled by not completing combustion of the blow gases, the remainder of the combustion could be carried out beyond the preheater. Ignition difficulties might arise here due to the reduced temperature of the lean gases after they had left the preheater, and it might be that some form of by-passing of the preheater, by an uncombusted stream of gas, would be required to overcome such a difficulty.

Concerning purging, it must be borne in mind that the volume of gas made per cycle as given in the paper was measured at 60°F, whereas within the plant and preheater the gases were considerably expanded as a result of their higher temperature. It might be of interest to record that, had a standard superheater been supplied with a generator of the size tested, the free space within it would have been only about 30% of that in the preheater. Presumably steam as well as air leaked from the preheater.

He would remark that the term 'B.W.G.' was used in the paper to mean 'blow-gas-free blue water gas,' and not blue water gas as actually made. The calculation of the analyses to this blow-gas-free basis was a necessary step in the examination of the results by the method used in the paper. It was, however, important that the reader should be aware of the usage adopted because, in practice, the reduction of the inert content of blue gas by purging increased coke consumption and, in comparison of test conditions yielding different qualities of blue gas, allowance must be made for this fact. The matter was further complicated because in the British Standards Institution's Test Code for Carburetted Water Gas Plant the term 'B.W.G.' was used to mean 'inert-free blue water gas'—a concept analogous

to that of dry ash-free coal. Accordingly, he would suggest that in future water gas reports the meaning given to the term 'B.W.G.' should be clearly defined and brought to the early attention of the reader.

Mr. K. Sheard (Newton Chambers & Co., Ltd,) explained that his company, following a suggestion by Dr. Dent, designed and supplied the preheater. In his paper, Mr. Percival had been concerned with the process rather than with considerations of plant design. One of the main problems at the time of the original discussions was whether the constructional materials to be used for the preheater tubes and in other parts of the equipment would withstand the unknown effects of water gas, steam, and blow gas at high temperatures, together with the fluctuating temperature gradients which occurred by the nature of the operating cycle.

He supposed there was no great difficulty in making theoretical calculations as to the effect of such preheating on the thermal efficiency of the process, but exactly what was going to happen to the various parts of the plant, particularly the preheater tubes and the generator grate, was largely a matter for conjecture. There was little experience to go on, and while subsequent tests on samples of metal in a blue water gas plant indicated that wastage by corrosion or erosion was not likely to be prohibitive, problems were involved in taking care of expansion and contraction stresses, while at the same time maintaining reasonable tightness between the two gas streams on the different sides of the preheater tubes.

In the event, most of the uncertainties gave little trouble, although, as related by Mr. Percival, some leakages took place and added difficulties to the evaluation of the experimental results. This and the problem of the mixing of successive streams at the change-over of the cycle, perhaps constituted the major obstacles to be overcome in the design of a preheater, and some solution would need to be found if the efficiencies forecast by Mr. Percival were to be realised.

Effect on Grate Bars

The author rightly at this stage ignored such detail considerations for the purpose of his paper, but it would be interesting if he could give some information as to the effect of preheating on the grate bars and other vulnerable parts of the plant. An alloy steel grate was used. Apparently preheats up to 600°C. were about as high as could be safely handled. Clearly these would be important items when the stage was reached of giving practical effect to the experimental work, and the fact that the optimum results were obtained by using relatively modest preheats of around 400°-500°C. might be of major significance.

As Mr. Percival had mentioned, the experimental work was primarily directed towards the enriching of blue water gas by methane. One's thoughts could not, however, but turn to the possibilities of preheating as applied to the normal processes of blue and carburetted water gas manufacture as practised throughout the gas industry.

Increases of 10% in thermal efficiency and 20% in output were by no means insignificant, and the elimination of the back-run when operating with maximum preheat, and the extension of the oil injection period appear to be attractive considerations. The results so far available warranted further examination of this aspect, preferably on an automatic plant.

Dr. G. Milner (Research Manager, Power Gas Corporation, Ltd.) said that the contribution which he was about to make to the discussion was a joint effort by his colleague, Mr. Kurt Ruschin, and himself. Mr. Ruschin was his firm's chief designer of gas generating equipment.

The author was to be commended for presenting his results in accordance with the recent British Standard Test Code. It was probably the first occasion that the results of a trial had been published in accordance with the 1951 Code, although the Code itself was based largely on the earlier publications of the Institution, particularly the 35th and 37th reports for which Dr. Dent was largely responsible.

The reasons for undertaking the work were clearly set out in the paper, but it was reasonable to expect that future large-scale developments on the lines of methane enrichment of blue water gas would be associated with other forms of gas generation and that any excess of steam produced in the process would be absorbed into the works system generating power from high pressure steam and applying low pressure steam for a variety of uses. Similarly, waste heat from other sources could be applied to the generation of electric power. Consequently, they would suggest that the real aim of preheating air and steam was the rendering of the process more efficient in regard to the consumption of heat, by returning heat to the system. A particular example of this method was the carbonisation of coal in large coke oven plants where practically no waste heat was available for steam raising, because of the efficient regeneration and return of heat to the system.

They would also draw attention to the conditions which obtained in large industrial organisations using the water gas technique for the manufacture of synthesis gas. Frequently, in such installations, there was available a large quantity of low pressure steam suitable for use on process work. With unreactive oven cokes, minimum carbon consumption per unit of CO + H_2 made—*i.e.*, per therm of gas generated—was usually obtained with air to steam ratios lying between 20 and 25 cu.ft. per lb. of steam. This, combined with high blast rates, gave rise to blow gases containing less CO than was obtained in the tests reported in the paper. It would be interesting to learn whether preheating under such conditions could give rise to savings of the same order as indicated in the paper. With the bigger quantity of steam used in the process, the preheating of steam might be expected to have a greater influence than the results set out in the paper seemed to indicate.

The suggested simplification of the plant was counterbalanced by the installation of a preheater, and here a balance must be struck between the saving on the maintenance of one type of equipment and the cost of the maintenance of another type of equipment. Had the author sufficient information available to assess the possible savings or otherwise of replacing the back-run gas valve by a preheater? How was the initial cost of the plant as a whole affected, and what was the working life of a preheater?

Reference to the possible longer oiling time on a C.W.G. set was of interest. The down-run process, now generally out of favour, permitted the longer oiling period which seemed desirable. They would mention, however, that one of the gas boards had had similar units of plant operating side by side on the two systems for nearly 10 years, and they had not yet decided whether a real advantage rested with either. Possibly the technique suggested by the author of eliminating the back-run might ultimately prove to be the answer for obtaining maximum thermal efficiency, both for oil cracking and in respect of carbon consumption.

Short Blowing Period

The rate of air supply used during the tests per square foot of grate area was about 85% of that used on large dry base industrial units fitted with mechanical grates, while the rate of gas production was about 80% of what was obtained on such large units. The somewhat lower output resulted from the use of a short blowing period of only 38 to 42 sec. The latter led to very efficient operation.

The author drew attention to the high ash fusion temperature of the horizontal retort coke. They would suggest that both cokes were satisfactory as regards this characteristic. The sizing of the cokes was also very good, and no doubt accounted for low pressure loss through the fire at the high blowing rates employed.

In connection with ash fusion temperature, it was well known that certain cokes with bad ash characteristics would only tolerate a moderate proportion of back-run steaming—*e.g.*, no more than 35%—and if the coke should be of the unreactive type made from very strongly caking coal, high loss of carbon in the ashes was likely to result. With a fuel of this type, did the author think that satisfactory control of generator conditions could be maintained when using sufficient preheat to eliminate the need for back-run steam? Experience in connection with normal producer practice and also in connection with gasification of coke with an oxygen enriched blast suggested that suitable techniques could be worked out for difficult cokes of this type.

Another item of interest was the effect due to the reactivity of the fuel bed. The reactivity of the bed was influenced both by the reactivity of the fuel and by the size of the coke. The reference to the possibility of gasifying coal using preheat for the steam only suggested that the more reactive the fuel the easier the problem. They would like to hear the author's views on, for example, the effect of a small size of coke or

of a more reactive coke. Would lower air steam ratios be essential, and if so, would the preheating of the steam tend to develop a greater importance?

As the author pointed out, the result of one of the tests was somewhat disappointing in that it suggested that preheating of the steam was of less value than preheating the air. One would expect that the return of heat to the fire should be equally effective whether carried by the air or the steam.

An item in plant conditions which attracted attention was the temperature of the back-run gases). High temperatures, together with the high temperatures of preheat, led to consideration of the application of the process to large generators. Mechanical difficulties in regard to such problems as lubrication presented themselves when considering dry base mechanical grate types, quite apart from the need for special heat resisting steels for grates. Obviously much development work needed to be done.

Other problems involving the production of blue gas with a low content of blow gases were relatively easy of solution and in the production of semi-water gas for ammonia synthesis they might say that no real problem existed.

Self-Sufficient Plant

Mr. G. Dougill (Planning Engineer, North Thames Gas Board) said that in the North Thames Gas Board they had made every effort to design water gas plant which would be completely self-sufficient as regards both steam and power, and this had meant that for blue water gas production a high blast pressure was used in order to develop the maximum amount of heat in the generator in the shortest possible time with the minimum development of potential heat as carbon monoxide in the blow gases. To conserve this heat in the generator a deeper fuel was used. With these arrangements it was possible to produce 86.5 therms of blue water gas per 1,000 lb. of dry coke and, in addition, 860 lb. of low pressure steam in the generator boiler, and 1,430 lb. of high pressure steam (300 lb per sq. in.) in the waste heat boiler. This compared with the author's results when preheating the air and steam of 96 therms of blue water gas together with about half the production of steam. Comparing these two figures, their process gave a total of 109 therms of combined gas and steam compared with a similar figure of 109 therms if the steam which was available for heat raising was added to the author's figures. The direct comparison was, however, on the one hand, of a completely self-sufficient plant as regards steam and power, whereas external steam and power would have to be supplied in the latter case.

In spite of this apparently unfavourable comparison, however, they were still interested in preheating, particularly the air supply, to a smaller extent for rather different reasons. When operating a plant with a properly co-ordinated power supply, the process steam must inevitably be supplied from back pressure turbines via a steam accumulator. This meant that the steam was saturated or even super-saturated, and at a low temperature and pressure compared with the slight superheat which was obtained if the steam was supplied via a reducing valve or the heavy superheat used by the author.

In their case, condensation could and did occur, particularly during the first up-run which followed the cold air blow. This had two detrimental effects. Steam during the first up-run followed a cold air blast and hence substantial quantities condensed in the clinker layer and in the base of the generator and was lost to the process. Some of this steam might be re-evaporated during the back-run and some of the remainder would be evaporated by the blow which followed. Any steam which evaporated into the blow would make a little blue water gas which in turn would be burned in the carburettor or superheater, so that a little advantage would be gained from this in steam production. If, however, the air blow could be preheated to between 100°C. and 200°C., both these conditions could be prevented or reduced substantially and, in addition, any risk of corrosion of the generator base would be reduced.

Mr. Percival's paper showed that any heat added to the blow would at least be regained from the process in the form of reduced coke consumption.

For a very moderate amount of preheat to the blow a very simple type of tubular heat exchanger could be employed using 300 lb. pressure steam from the waste heat boiler, and their calculations showed that there was just about enough surplus steam to carry out this operation, though it would, of course, use steam which at present accounted for the surplus current from the plant. From the figures given by the author, it would appear that the gas-making efficiency would be increased slightly, any risk of corrosion avoided, with the net result of a slightly reduced coke consumption at a cost of producing little or no current above the needs of the plant.

Dr. F. J. Dent (Director, Birmingham Research Station, Gas Council) mentioned that the investigation began during the war when they were studying methane synthesis primarily for use in high pressure gasification. Uncertainty then developed regarding supplies of oil for carburetted water gas manufacture after the war, and they extended the synthesis work to cover the enrichment of blue water gas. It was during the consideration of this problem that it was realised that, with synthesis, there would be a surplus of waste heat available and that one use for it would be to return it as preheat in the air and steam. Fortunately, circumstances had not developed as they feared they might, and this investigation therefore remained as an illustration of a method of obtaining considerable control over the system of heat liberation which they used in one of their main processes. One could visualise it being applied in a number of directions, and several suggestions had been made in this excellent discussion.

The general conclusion to be drawn from the experiments was that preheating the air and steam was quite a practical proposition as far as conditions in the generator were concerned, and it had quite a remarkable effect on the performance obtained from the coke supplied.

A Double Edged Sword

The saving in potential heat as coke was considerably greater than the amount of heat returned as preheat, due, of course, to the fact that when preheating reduced the amount of heat to be liberated in the fuel bed, it also reduced the losses incurred in the process. It acted, in effect, like a double-edged sword.

The saving would have been still greater if advantage had been taken of the tendency towards blue gas of improved quality. This was rather unexpected. In fixing the conditions for test, they thought that, as a result of preheating reducing the proportion of steam required on the back-run, there would be a more even distribution of temperature from the top to the bottom of the fuel bed, giving a greater opportunity for undecomposed steam to react with carbon monoxide. It was therefore decided to maintain the composition of the blow gas steady so that any such tendency during the run should be manifest. As the results showed, however, the tendency was in the other direction and, if the steam supply had been adjusted to maintain the composition of the blue gas instead of that of the blow gas steady, a still greater saving in the consumption would have been obtained. The total saving might then have been as high as 15%.

Obtaining this saving would inevitably have increased the amount of steam required from an outside source, but, where breeze was available, it would probably be economical for a base load plant.

With the preheater in the form of a recuperator, heat was recovered from both the blue gas and the blow gases. The bulk of heat available was, of course, in the blow gases, and, if it were a question of preheating only the steam, a regenerator could be used. It might be imagined that this would be the simplest method of heat return since, by using chequerwork at a high temperature, the amount of preheat in the steam could have been almost equivalent to the intermediate degree of preheat in both air and steam which was found so beneficial.

It was not so, however. While preheating the steam alone might bring advantages in some directions, it was not the best way of minimising the coke consumption. This required the retention of the back-run, and since down-steam could always be preheated in the upper layers of the fuel bed if oil cracking was not a consideration, only the heat carrying capacity of steam supplied to the base of the generator was effective, and this was limited.

Taking the results as a whole, he thought they were sufficiently encouraging to be pursued. But for the next stage the generator should be larger, it should be self-clinkering, and whatever arrangement of preheater was used, particular attention must be given to the ease of purging and to avoiding losses by leakage. Small plants were always difficult to purge, but this initial experience had emphasised the importance of this aspect for plant of any size.

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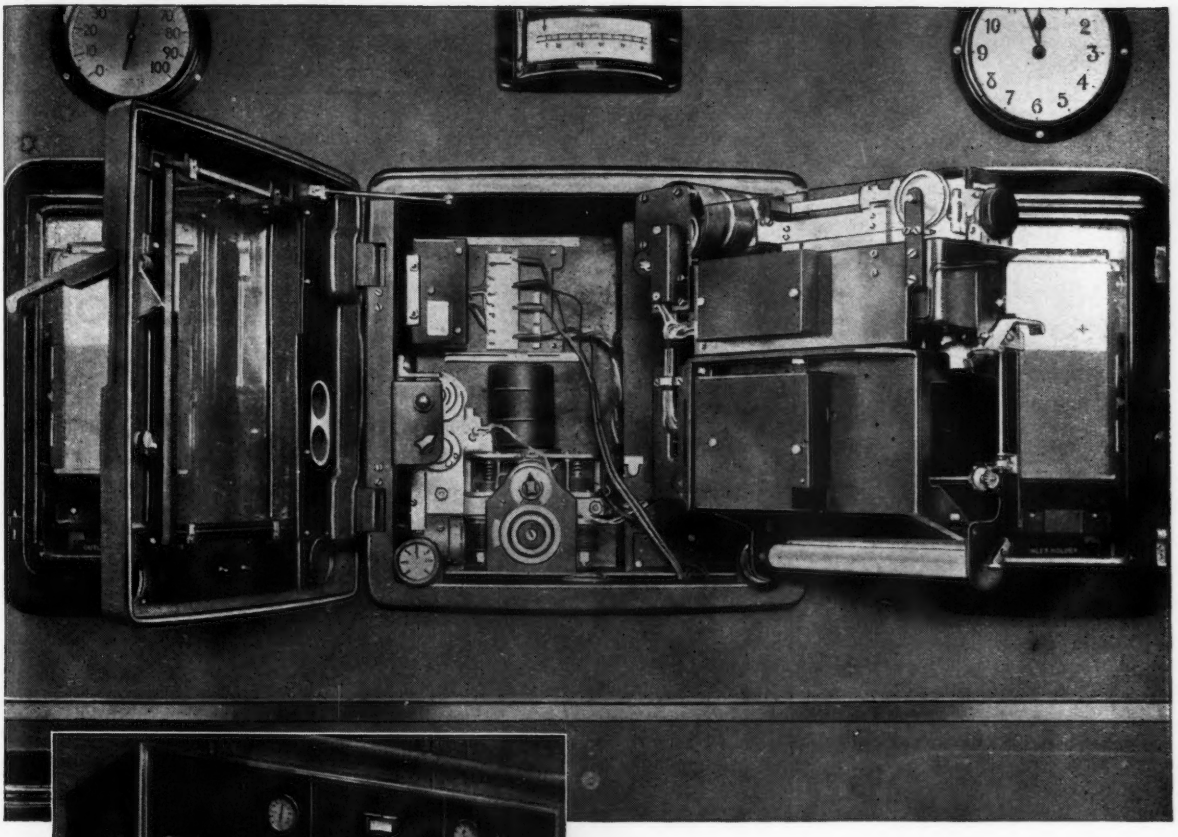

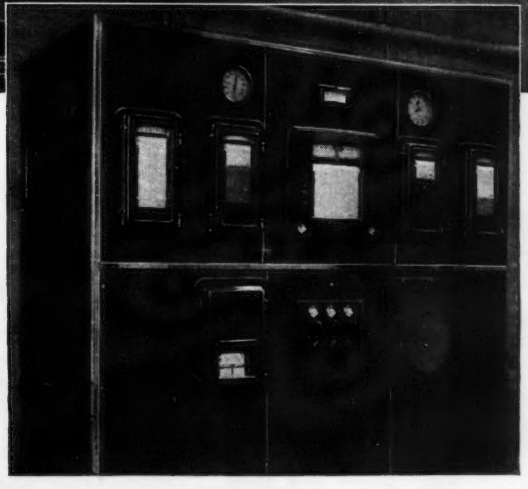

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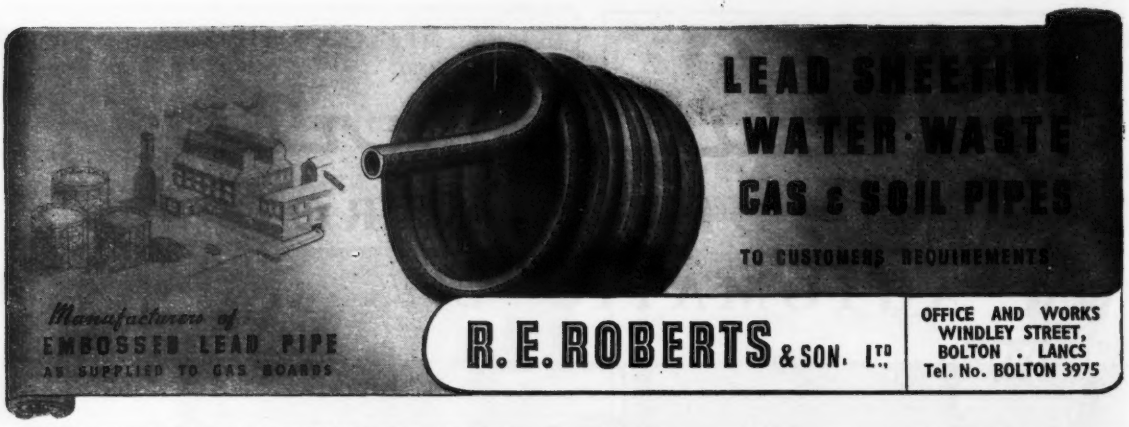

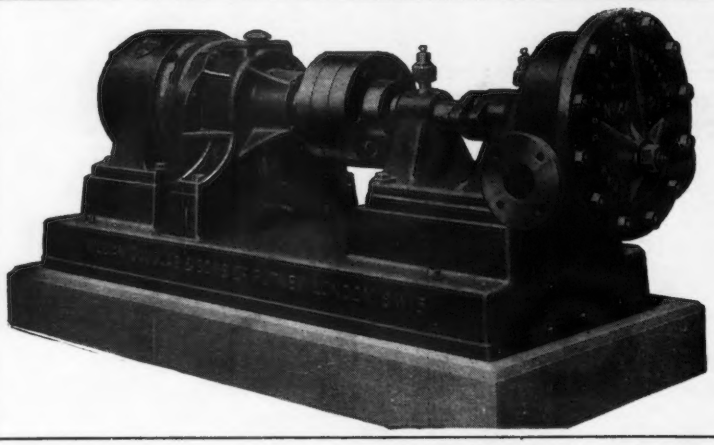

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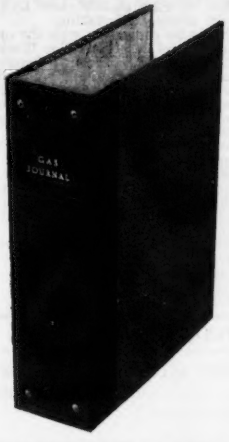

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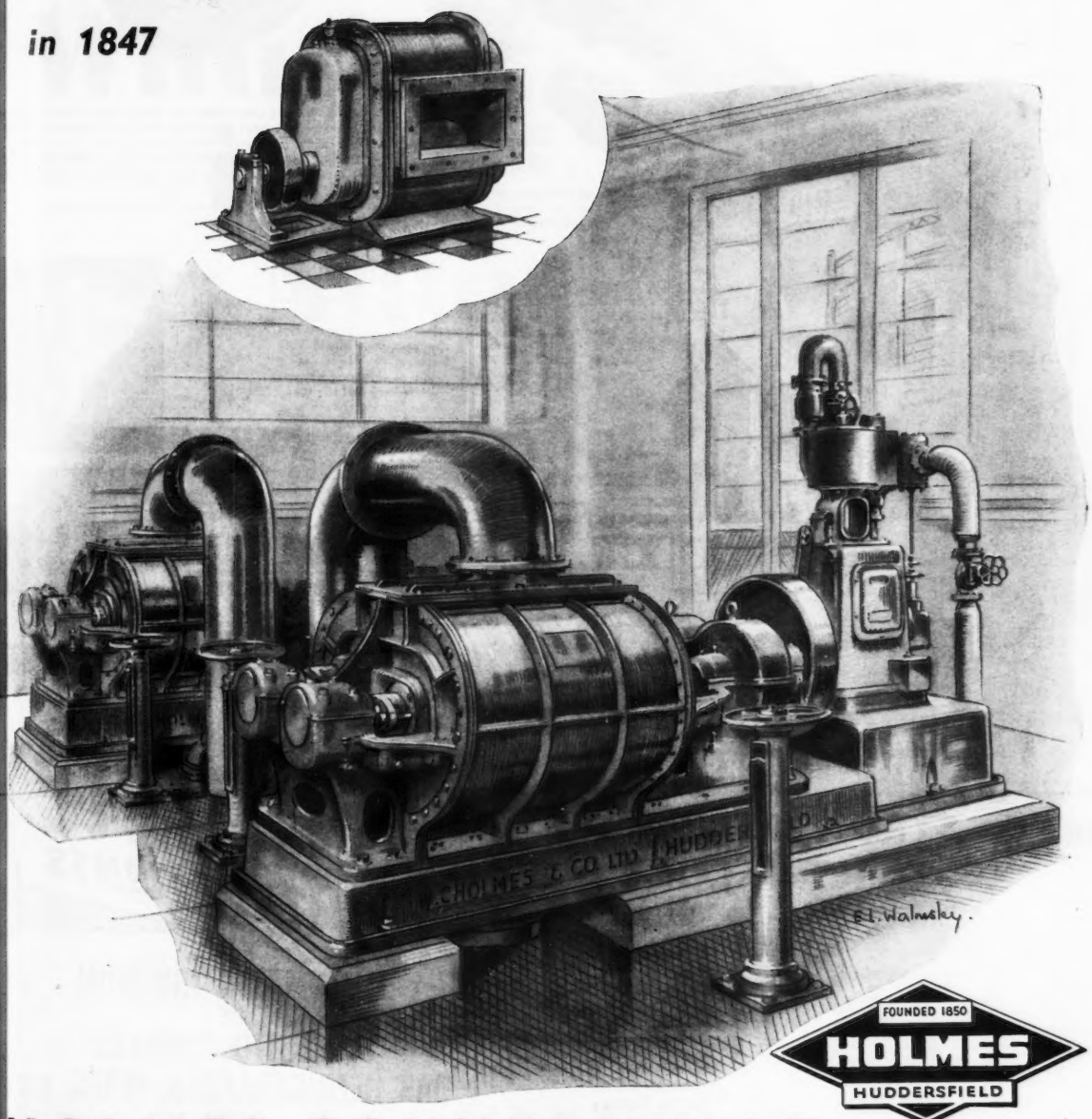

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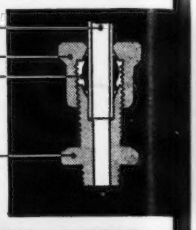

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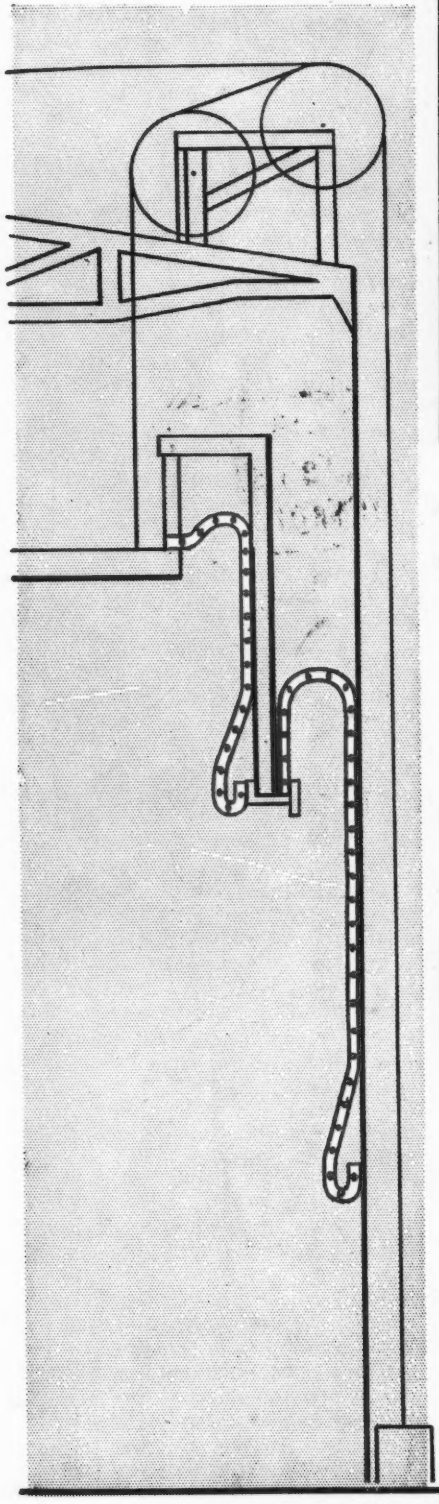

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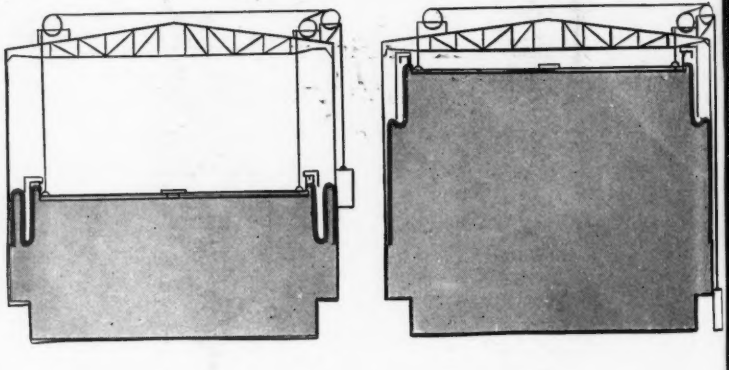

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